BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

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IN THE MATTER OF: :

STANDARD MARKET DESIGN : Docket Number

DATA AND SOFTWARE STANDARDS : RM01-12-000

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Commission Meeting Room 2-C

Federal Energy Regulatory

Commission

888 First Street, N.E.

Washington, D.C.

Thursday, July 18, 2002

The above-entitled matter came on for technical conference, pursuant to notice, at 9:05 a.m., Alison Silverstein, presiding.

APPEARANCES:

ONGUN ALSAC, Senior Vice President
Nextant, Inc.
JOHN FINNEY, Director of Technology
ABB, Inc.
GUILLERMO IRISARRI, Executive Vice President and
Principal Engineer
OATI, Inc.
PETAR RISTANOVIC, Executive Consultant
Siemens Power Transmission and Distribution, Inc.
Corporate Engineer
JAY BRITTON, ALSTROM, Corporation
HOWARD SCHMIDT, Vice Chairman
President's Critical Infrastructure Protection Board
CHUCK NOBLE, Information Security Coordinator
New England ISO
CHERIE BROADRICK, Manager Corporate Planning
ERCOT
DAVID LA PLANTE, Vice President Market Development
New England ISO
ANDY OTT, General Manager of Market Coordination
PJM ISO
ROBERTO PALIZA, Principal Consultant
Midwest ISO

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APPEARANCES (CONTINUED):

DON WATKINS, Chairman, Common Systems Interface Coordination Group
Seams Steering Group - Western Interconnection (SSG-WI)
CLARK GELLINGS, Vice President Power Delivery and Markets
Electric Power Research Institute
DAVID SUN, Corporate Engineer
ALSTOM Corporation
ALISON SILVERSTEIN, Federal Energy Regulatory Commission
MARVIN ROSENBERG, Federal Energy Regulatory Commission
THOMAS O. RIELEY, Federal Energy Regulatory Commission
THANH H. LUONG, Federal Energy Regulatory Commission
DICK O'NEILL, Federal Energy Regulatory Commission
BILL HEDERMAN, Federal Energy Regulatory Commission
PHIL OVERHOLT, United States Department of Energy

P R O C E E D I N G S

(9:05 a.m.)

MS. SILVERSTEIN: Thank you for coming to FERC's conference today. Our topic is Standard Market Design, and Software To Support That In Wholesale Electric Markets.

I am Alison Silverstein, Advisor to Chairman Pat Wood III. With me today are numerous members of FERC staff, some of whom are sitting up here and some of whom are in the audience and prepared to throw us hard questions as the opport unity arises.

Let me introduce the folks who are here. We've got Tom Rieley, Thanh Luong, Dick O'Neill, Bill Hederman; we are joined, happily, by Phil Overholt of the Department of Energy. And Marv Rosenberg of FERC. And other folks over on the side who will help us as appropriate later in the afternoon.

As you all know, but just for the record, Standard Market Design, the purpose of this is to reduce transactions costs and to reduce the costs of making markets work and to improve their efficiency.

In the future, we have heard repeatedly and we are hoping that it's wrong, that software will be a potential impediment; that scalability will be a challenge as we move to larger regional transmission organizations, and that people with bad intention are trying to hurt the

electric industry and trying to damage the instructions and the software that underlie electricity, that underlie our society.

And so part of what we're doing in trying to get a handle on what software capabilities are and what software needs are is to make sure that software can support markets in every way:

To assure their efficient operation, to assure that they remain secure in their operation and they support the needs of a competitive market as well as a secure infrastructure.

We are happy to have so many vendors and so many people here representing the ISOs and the RTOs and those of you who make this stuff work for a living, we thank you for caring about this topic and taking the time to share your knowledge with us.

And what else do I need to tell you? The agenda is in the back of the room. The bathrooms are past the elevators. If you need to get up and walk around, do so. We schedule long panels and we keep going, so if you need to leave the room, do so. And we will walk in and out because we have a lot going on today, but it doesn't mean we don't care about you. So we apologize for that in advance.

Anything else we need to mention, Dick? Let 'er rip. Okey dokey. Our first panel is on software

development. And these gentlemen have been kind enough to roll with the punches today because we have a slightly disorganized agenda and plan for what we're going to cover, and part of it we're going to make up when we go along, but our general format is that I'm going to ask each of them to introduce themselves and their organization.

Then I've asked each of them to give an overview with respect to major chunks of software that are needed to make a market work, and then each of them is going to talk for another five minutes in a prepared text, and then those of us here are going to start asking questions, and we will have a time for audience participation in case you've got questions you want answered, and I expect that they will want to respond to each other's questions and comments as well as to us. So we're just going to roll with it.

The other thing that I need to tell you if this gets long is that I have a watch, I'm not afraid to use it. So if people start going on on something that doesn't appear to be real focused on the topic at hand, I will try as politely as I can to move us back to the issue in front of us.

So let's start with you, Mr. Ristanovic and hear about you and your organization.

MR. RISTANOVIC: Good morning. I'm glad to be here today to talk about this important topic. My name is

Petar Ristanovic. I am from Siemens Energy Management Information Systems from Minneapolis. My company is a worldwide provider of software for electric utility computer centers and energy management, distribution management market systems.

We are in business for over 30 years if you count ComtraData and Impros and Siemens and Telegear and all the companies who are making Siemens Power Transmission and Distribution. And we are here today to present our views of how we can build software cheaper and better and make these RTO ISO systems more efficient and less expensive.

MR. FINNEY: Hi. I'm John Finney from ABB. As you probably know, ABB is a global automation and power technology company serving the energy electric power customers worldwide. We have about a thousand IT professionals in four different countries building systems to support not only central market activity but retail systems and wholesale systems.

I hope today, in addition to helping clarify a bunch of issues, we will also have the opportunity to convince you of the needs for standards and integration techniques that can be used to produce these systems more cheaply and more reliably.

MR. IRISARRI: Good morning. My name is Guillermo Irisarri. I represent Open Access Technology

International from Minneapolis, Minnesota.

Over the past seven years, OATI has been very active in the development of computer applications to support the deregulating efforts in the United States and North America in general.

We have been very much involved with two of the main systems that are used today in that support fashion. One of them is the tagging system, which as you all know is a real time system that encompasses the whole of North America, and the second one related to the tagging system, which is very pertinent to the efforts of the Standard Market Design is the IDC, the Interchange Distribution Calculator, which is the tool currently used in the Eastern Interconnection of the United States to manage congestion. And it has quite a few of the elements necessary to support the development of systems such as the ones envisioned for the Standard Market Design.

The issues related to the development and support and maintenance of those systems are pertinent issues to the issues that will be faced in developing each and every one of the applications that comprise the Standard Market Design and thus the experience that we have gathered in developing those, maintaining, standardizing and using already available standards in their development, will be pertinent to any of the future plans envisioned for the SMD.

So we are very happy to be here as well and looking forward to the discussion. Thank you.

MR. ALSAC: Good morning. My name is Ongun Alsac. I am from Nexant, Inc. in charge of Power Computer Applications Division. We are located in Mesa, Arizona. Our division is mainly responsible for the stand-alone integrated market-related software products of the company.

Since 1984, our group specializes in high end power system software development. Over the years we have developed many market-related software applications, including state estimation, topology estimation, security analysis, optimal power flow, which can be used for congestion management, bid-based dispatch, LMP calculation, preventive and corrective dispatch, voltage and reactive power dispatch, financial transmission rights, rights auctions and allocations, simultaneous visibility analysis and maximum transfer capability.

Some of our software I mentioned about is used worldwide in about 100 control centers in online mode and most of them have been integrated with the systems of almost al major EMS vendors. This puts us in a unique position to share our experience in the Standard Market Design discussions.

We are very pleased to be here on this panel to express our views.

MR. BRITTON: Good morning. I'm Jay Britton. I'm with ALSTOM Corporation. ALSTOM is a global supplier to the electric utility industry, and what's most pertinent to this discussion is that we're a major supplier of market systems. And it's a pleasure to be here this morning.

MS. SILVERSTEIN: Well, it's a pleasure to have you all here. Thank you very much. The first thing I want to do is to get an overview of the functionality of the major pieces of software that are needed to run markets.

And I've put these gentlemen on the spot by asking each of them with no warning whatsoever to talk for up to five minutes about a separate chunk of software, and it most cases it is about a piece of software that this company has running in one or more ISO areas.

So our first topic will be the functionality behind an FTR software and the processes which it performs. From Nexant, Mr. Alsac will be speaking. Thank you.

MR. ALSAC: Our company has done a number of software projects. We have done what is called TCC obligations for New York ISO about four years ago. This was followed up by a DC model of the same point-to-point obligations approach for PJM. Two years ago we were asked to develop a multi-period obligations package for New York ISO. This has been delivered and New York is testing this multi-period software which they will change their market,

and also very recently we have completed a project with PJM combining obligations and options.

MS. SILVERSTEIN: Would you be good enough to walk us through what an FTR model does please?

MR. ALSAC: Yes.

MS. SILVERSTEIN: Thank you.

MR. ALSAC: So this gives us a lot of understanding of the FTR definitions. FTR is mainly a separate, not an online but a separate market system used for hedging any a real time commitments and it is done in terms of monthly, sometimes six-monthly. It is possible to have it seasonal as well as yearly, five-yearly auction periods where participants offer buy-sell bids, and these bids in general can be what is called point-to-point, or in some markets, also defined as flowgate bids.

And also recently both obligation type of FTRs and option type of FTRs have been asked in different ISO designs, and FTR, Financial Transmission Rights calculations, should address these things.

And it is also possible, as I mentioned, for FTRs to be a single period, like a monthly FTR for that specific month, or a multi-period where it is over a number of periods can be used.

When we look at, again, the requirements of different ISOs, we see that there are specifications where

DC network type of models can be used. There are also specifications where AC type of network models are used, and for the DC network model markets, there's a concern of representing losses. There's a concern of representing voltage and reactor power effects. But again, it is understood that this is a financial system and it doesn't have to mimic exactly the actual operation of the system in real time.

And I think this is like a brief summary of the main financial transmission rights. It is also this involves a couple of other calculations, and one of them is simultaneous feasibility testing where initial allocations are tested whether they are feasible or not. This brings a problem of if they are not feasible, what to do, and that is part of simultaneous feasibility analysis where how to pro rata curtail the existing rights to make them feasible.

Also another problem associated with FTRs is multi-round FTRs where it is used by many ISOs for price discovery. An auction is held and results are awarded in certain percentages, and everyone sees the results and they keep bidding. They can continue buying and selling, so this is part of the FTR problem.

And an intimately related issue is what to do with the auction revenue rights, how to allocate FTR auction revenue rights and how to do this fairly and how to get it

right. This is a big issue in the FTR area. And basically the software. We have developed software for all these components.

And our experience, just to summarize, is that although it is one of the most computationally extensive or expensive network grid analysis calculation for the existing size of ISOs, it is still feasible to do these things on today's existing computers.

MS. SILVERSTEIN: And if we were to look under the hood of one of these models, what kind of computational techniques would we see inside?

MR. ALSAC: Most probably it is DC models based on linear programming techniques or AC models based on nonlinear programming techniques.

MS. SILVERSTEIN: Thank you very much. Our next discussant will be Dr. Irisarri from OATI who will talk about the day ahead market.

DR. IRISARRI: Okay. As probably you all know by now, the Standard Market Design calls for essentially three types of systems. The first one was already discussed by Ongun here, the FTR location.

Then there are two markets that we have to deal with, the real time market, essentially a balancing market, and the day ahead market. The day ahead market basically consists in the scheduling of all the resources available in

the system for the next 24 hours. Typically, the result, the schedules are providing starting at say the midnight of a day and covers the whole 24 hours of the day, based on the following considerations:

The participants in the markets, specifically the generation participants, submit voluntary bids into the system. Those bids are typically for this kind of problem the day ahead market problem, are multi-part bids that include the startup and shutdown costs of generating units, include the energy bids, and may include bids for reserves as well.

The outcome of this process will consist of all the generating unit schedules for the next 24 hours necessary to meet the demand, and it should incorporate requirements such as an ability to provide bilateral schedules; that is, schedules that have been prearranged between two parties, as well as self-schedules for certain generating units. For instance, large generating units, nuclear-type units, or many large coal-fired units are either prescheduled or they remain at a baseload capacity during the day. Therefore, those are essentially precommitted and they will not necessarily participate in the day ahead market calculation.

Now what are the calculations for the day ahead market and what are the complexities? The main calculation

that is used to do the resource scheduling for the day ahead market as we all know is called a unit commitment. That obligation has been around for many years in the electrical industry at different levels and for different system sizes. But now it takes a significant relevance due to the very large sizes that are ambitions for the RTOs.

If you consider an RTO today of the size of the Midwest ISO, for example, which includes in excess of 2,000 generating units, out of which possibly a great majority of those will be participating in the day ahead scheduling process, that would be a very significant size issue in the solution of the problem.

Then you have to add to that problem the next aspect which traditionally has been ignored in most unit commitment development, which is the network concerns, and in particular the congestion associated with the network operation. Therefore, this type of unit commitment for the next day is called security constrained unit commitment where "security" in this case means the satisfaction of all the requirements of the electrical network.

That is, there should not be any violations in transmission flows in transmission facilities, in transformer facilities, et cetera. So it should remain feasible, not only for a base case condition, but also under the possibility of many contingencies, where a contingency

would be the outage of one or more facilities, either generating facilities or transmission facilities.

In addition, reserve requirements have to be maintained for the whole system and for individual control areas, in many cases, particularly in systems such as MISO, which is made up of in excess of 45 or so control areas, each control area has a reserve requirement of their own, and the unit commitment application for the resources scheduling for the next day has to satisfy the reserve requirements of the whole interconnection of the whole system of the whole RTO as well as the individual control areas.

There are two main outcomes of the resource scheduling problem. One of them is going to be of course the schedules themselves for the generating facilities. The second one of significance to the operation of the market is the market signal provided to the participants, and those are typically the locational marginal prices are all of the buses or nodes in the system, or in some instances may be grouped into zones or hubs or aggregates of various kinds.

So it has those two significant outcomes, as I said. The schedules themselves as well as the market signals, LMPs, as you -- today, some of the markets are already operating basically as I have described, and the New York ISO is one of those. PJM is another one that also does

some sort of resource scheduling. They provide exactly this kind of information.

Now what are the tools that are needed to solve these problems and what are the complexities?

The unit commitment and security constraint unit commitment problem is typically formulated as a non-linear optimization problem. In these cases, it's a non-linear problem, although it may have linear constraints. It's a non-linear problem for a variety of reasons.

First of all the bids. The objective function itself, which is the total cost of operating the system, is a non-linear function and some of the typical constraints in the unit commitment are non-linear constraints as well.

In addition, it has a time factor associated with it. The dispatch is done over the period of 24 hours. So it adds another dimension to the problem.

And associated with time, of course, is the operation of the generating facilities. The generating facilities have to be ramped up or down according to the requirements of each one of those generating facilities and that has to be taken into account in the problem.

In addition, some of those units have a minimum start-up time or a minimum shut down time. They cannot be started instantaneously. They cannot be shut down instantaneously and that has to be taken into account into the problem.

The problem is typically sold as a non-linear optimization problem. The algorithms that are typically used to solve large scale unit commitment problems is the

so-called LaGrandian Relaxation which is familiar to most operation research people here, and it also has an element of dynamic programming within it where the LaGrandian Relaxation process consists of formulating a primal problem which is decomposed into individual problems for each of the generating units.

Each individual problem is solved as a dynamic programming problem for the next 24 hours. And then there is an external loop which is called the LaGrandian Relaxation Loop that adjusts the penalty factors in this case which ultimately are actually the data needed to compute the locational marginal prices.

So in a nutshell, that's what I learned in college a few years back --

(Laughter.)

MR. IRISARRI: -- and we at OATI have been very interested in all of the aspects of the standard market design and have developed tools already to support those including the auction and including the real time, and particularly we are very interested in the day-ahead market as well.

Thank you very much.

MS. SILVERSTEIN: Thank you.

Next to talk about the real time market will be Mr. Britton with Alstom.

MR. BRITTON: Well I think I am going to try to stay at a little higher level because I don't want to go that deep.

The real time market essentially is required in systems because whatever you do up front to try to arrange the schedules, the actual load that occurs at a particular time is not precisely predictable. And you have some last minute adjustments to do and the electrical system will take care of that pretty much by itself. But you need something to figure out in the context of markets what's actually happened and who owes what to whom for those corrections.

So the start of the real time market is a state estimation. I understand somebody else is going to talk about state estimation but state estimation gives you the current state of the power system, and that's the starting point that you need for figuring out what's going on.

The state estimation serves as the basis for what's called "security constrained dispatch" and that allows you to look at whether there's congestion in the system and eventually calculation the locational marginal prices in the network that actually exists.

On the basis of those results, according to the rules of the market, the accounting of who did what to whom is made. Thank you.

MS. SILVERSTEIN: Showing unusual restraint, you clock in as the fastest performer here.

(Laughter.)

MS. SILVERSTEIN: But I'm going to give you another chance when we get into the mountains and see if you want to take more time.

And next to talk about the State Estimator, we have Mr. Finney with ABB.

MR. FINNEY: Thanks. Well, of the three components we're talking about here, the day-ahead scheduler, the real time scheduler, and the State Estimator. This is the black box that does not have immediate transparency to the market participant himself, because when we deal with both day ahead scheduling and real time scheduling, we're integrating the optimization of the bids and the market itself and has an interface. So the State Estimator is the least understood but has a very important role. When we start with day-ahead scheduling, we use as our network, our network model since the data that comes from a database which says this is what we think the grid will look like tomorrow based upon what we think it looks like today. And that's fine because the next day, when we go to do the real time scheduling, we have the opportunity to update that network model.

Now there's an immediacy required now that was

not there in the day-ahead schedule. So rather than using static data, we used a computer program called a State Estimator to tell us exactly what the grid looks like exactly now when we begin the clearing of the real time market.

Now the technical challenge here is we receive our knowledge about what the grid looks like from two different sources. One is what we think it looks like from what lines we know to be in service, what transformers we know to be in service, and then we receive real time telemetry which is piped in from transducers all across the system. Way back in graduate school, we learned a basic set, very simple actually, of non-linear equations that relate voltage and angle to real and reactive power flow. So when we have all of this telemetry, there is a set of equations that in principle we should be able to solve that will tell us exactly the state of the grid. And when we did the homework problems back in college, the answers always worked out just fine and we went to the next problem.

Somebody has to go there. So, and if it were as simple as that, this question wouldn't have come up today because the problem is is that transducers are notoriously bad, right? Data gets, in the same way that when reports work their way up to you messages get scrambled exactly he same thing. Bad data comes in from the network and the

State Estimator is responsible for deciding, okay, I have bad data. How do I get a good estimate of what the grid looks like from bad data.

Now this is not a new problem. This is the problem that everyone here has been solving in the industry in the context of EMS SCATA systems for quite some time. The problem that we see now, when we look at real time scheduling markets is availability of good answers of this data. Convergence of State Estimators is not guaranteed. If the data is too bad or if the telemetry fails, or for a variety of other minor reasons, we will not get good answers out of the program.

And for years, you know, I think standards in the industry is if you could converge 95 percent of the time, that was fine; 99 percent of the time, that was fine. Now why was that? In the past, this data was being used pretty much exclusively by the control center operator himself to maintain the reliability of the grid and if we want a couple cycles or minutes or hours with the State Estimator not performing fine. It wasn't a big deal because we could keep the grid reliable. But in the modern real time scheduling applications, we can't have no data coming into the program as we clear bids on a five-minute or hourly basis. So the challenge that I think prompts the question today is are we prepared to modify our State Estimators so that we can

recover from the previously assumed normal situation of it's okay not to converge all the time, and can we guarantee that we won't let down the market systems as we head into real time scheduling.

And the answer here fortunately is yes because we ran into this occurrence of course in our deployment at Ontario IMO and were forced to sit back, scratch our heads, and perform, you know, some fairly significant modifications to the estimator program, which would guarantee that when we couldn't get a perfect answer to feed into the real time scheduling application, we could get one that would allow the market to continue to function without destroying the transparency associated with good clearing price information out of the algorithm. Thanks.

MS. SILVERSTEIN: Thank you.

And to talk about how all of these models and software pieces are integrated together, from Siemens, Mr. Ristanovic.

MR. RISTANOVIC: Thank you very much. I guess I was lucky that this drove as closest to what they prepared. All these large components plus a few others like market monitoring, install capacity market, support systems, complications, have to work nicely together on very large systems. And that is one of the major sources or high cost, high start-up costs and high maintenance costs to manage

market management systems.

And we see that as a potential area. There is a lot of room for improvement that results in a much shorter implementation schedule, a lower risk of implementation and much lower cost of implementation.

What helps in this situation is that these systems are not real time EMS SCALA top systems, which immediately points to the advantage that you don't have a large throughput and high volume of data like you have on typical front end for EMS data systems.

Once you have that fact in mind, immediately you get the good candidates for kind of integration techniques to use in similar systems, in communications, banking, phone industry, gas industry, which are mature third party open products which definitely reduce costs of implementation and make implementation a kind of modular and flexible for changes in the future.

And these are practically the main aspects of the integration techniques that we have to use in systems like this to guarantee that we achieve minimal possible cost in start-up for the systems, in future maintenance and other notational changes.

We at Siemens about five or six years ago have started a very expensive overhaul of our product, trying to prepare our product for what's coming for this deregulation

of market from traditional EMS customers to GENCO, Transcos, Energy Market Systems, EMSs. So we kind of split our components and make it kind of flexble to assemble together for different needs.

Because initially we realized that many of these components the same components are used in these different market segments. That fact and fact that throughput, as I said, and amount of data going through is kind of relatively small compared to traditional large EMS SCALA systems pointed us to use of integration techniques that is heavily used in other industry called enterprise integration bus with XML message payload.

There is a significant number of third-party vendors who have very mature product in this area. We early realized that using this approach significantly cut our integration/implementation testing cost and produced a system with great flexibility for changes in the future.

Another aspect of our approach is that we are seeing more and more that software development is expensive. Customized systems are very expensive and very risky.

In a competitive environment where prices are practically bare bones prices, you as a vendor are in a situation where you enter with a low price a very complex system, a lot of customization which is very difficult to estimate and predict.

You typically run into a scenario where you are not happy, business is not healthy, customer is not happy, regulator is not happy. Overall situation is not good for anybody involved in the business.

That's why we heavily push and advocate standardization since five, six years ago at EPRI, and we hope today we'll talk more about that. Because we believe that using standardized components--and we have a pretty good idea of how to functionally encapsulate components to minimize interruptions and to have some good functionalization--definitely a wise possibility that has definite impact on the reduction of the cost.

Another aspect in what we are promoting is that because of software development expenses we cannot, as we did in the past, develop everything and have every sort of component.

We want to be global solution provider but we see other companies at some point in time have a good software components and we'd like to use those components when we provide system solutions.

And in order to do that, we have to open our system. We have to have architecture of our floating components from specialized companies which is at a point in time the best in the market can fit in our system with a cost that is reasonable. But that can still fit the

functionalities we need but at a reasonable cost.

So that's another driving force in taking this approach. I would like to mention other aspects of this large system, and that is maintaining data model for this system. These systems, what we mention here a couple of blocks, we're talking about a large number of functions on which of these blocks, and there is a large amount of data and modeling requirements to support these kind of systems.

And then you're working in one environment where one TO doesn't want to be and this RTO wants to be another one so you have to be able to modify those models, expend it in a way that your system doesn't stop, it doesn't cost you a lot to do that.

So another really important aspect in our approach is that we firmly believe in centralized data maintenance of the model, a CIM-compliant, EPRI CIM-compliant model. That is something that is very expensive in existing systems. If you talk privately to any of the existing ISOs, RTOs, they will tell you a lot of cost is incurred by just maintaining modeling their systems.

Once you see that something finally good is happening for vendors, and that's the fact that technology's finally outrunning consultants so our requirements of consultants are improving all the time are beginning to lag behind technology, so IT technologies communications

operating system, the open tools are in very, very good shape today.

And once you start using those things, that they're kind of default when you start thinking about what to use to solve some problems, you automatically get to something that is used in all other industries. That is what we call Application Service Provider Model, or leads in the software.

We tried that model, or what used to be, or supposed to be a LANS RTO and we were able to deliver that whole system in market trials as the service on the web. All the software was in our data center and software of other companies integrated in the traditional bus and work the frame relay, and all of our customers' side, we used to be a large computer center in a relativelyh small building with a few people working there.

As I said, this was automatic result of when you start collecting all these IT tools and see how other industries are addressing software business and we firmly believe that is the future of our business too.

That would be in short what I can say unprepared for this topic.

MS. SILVERSTEIN: Thank you. Now each of you prepared a five-minute statement on a mystery topic and I am eager to hear what each of you have to say.

It has been a real busy month and so we didn't have a chance to prepare as much and be as organized as we would like to be for this, and thank you all for rolling with us today. I'm sure we will all get something out of this, even if we're surprised at what it might be.

Let's start with Mr. Britton please, and hear what you've got to say.

MR. BRITTON: Thank you. My mystery topic is standards for software.

First of all, I'd like to say that Alstom fully supports the idea of SMD, standard market design. We think that there are technical challenges of course, as there are in any large software project and some special challenges, such as the tendency toward larger systems as we move in the direction the FERC is heading. But we don't see any show stoppers here. The thing that we thought was probably going to be the most interesting topic for the day was the opportunity that SMD provides for software standardization. Market standardization kind of leads logically to what can you do in the way of software standardization.

And we have some specific recommendations. First of all, we are committed to the principle of open competitive supply and we think these standards and regulations around markets can help foster this goal, and in additional standardization regulation can do things to make

systems more effective as well as affect the competitive nature of supply.

Appropriate standardization regulation, though, is a theme that I want to hit hard here. Appropriate means you have to look at the cost/benefit case of what you're proposing and prioritize those efforts. Of necessity, we're going to have some groups that need to focus their attention and they need to pick the highest priority fruit first and work on that. And standards are not automatically good. Standards need to be well chosen and well designed.

So we have a list of what we think of as high leverage areas for standardization and I'll just summarize those quickly here. The first one is security which has to do with identifying the people that are dealing with the market systems and what their permissions are. And this is standard computer industry stuff that ought to be handled in standard ways and we should pick something that's consistent and do it.

The second one is standardizing the way participants interact with the markets. There are lots of examples of good standardization efforts out there that solve problems like this one. The standard market design should make this relatively easy topic to get our arms around and highly beneficial because it'll result in a higher quality understanding of exactly what that interface

is.

Third item. We should require open software interfaces to encourage vendor competition, and I didn't use the word standard there, I used the word open. And that's because I think the biggest bang for the buck is simply making sure that interfaces are disclosed and that there aren't any legal constraints on the use of those interfaces by other vendors that want to compete in supplying components to the market.

It is possible to go further and talk about supported interfaces and standard interfaces but one has to recognize that those take, have a lot more cost and a certain amount of risk in terms of going through the design process to achieve those. In certain situations, it may be justified.

The fourth item is another open one. And that's make the power system model data around the industry open. That is make it available, make it so that when we I think Petar alluded in his talk to the importance of the power system model preparation in putting a market system together and indeed in the quality of the market the results. It's a very difficult process and one of the practical problems that hits us in building models and building systems is access to good data. Because access to data is impeded by proprietary contractual constraints between vendors of

systems and the owners of those systems.

We'd like to see those constraints removed. If we could just get the data and understand the format it was in, it would help us immensely.

Our fifth item also deals with modeling. At the moment in the process is building models. They're very difficult. They require quite a few people and they go to quite a few different sources, and the process of modeling is one in which you're looking, you're just trying to find any source for the data, and the quality issues are not dealt with adequately in our view. And I think that it would be very important to stabilize the whole concept of markets and put it on a solid foundation to develop better quality standards for the models on which all of these computations are based. Garbage in, garbage out. You got bad data in, you got bad data out.

And we think it's quite feasible to come up with some good ways of assessing model quality.

MS. SILVERSTEIN: Let's talk about that for one more second. When you're talking about model quality, you're really talking about the underlying data quality, correct?

MR. BRITTON: Accuracy of the model in representing the power system because you can't get good results out unless you have an accurate model of the power

system. Essentially, you're going to be solving the wrong system if you, if you --

MS. SILVERSTEIN: But is that a function of the fact that you have inaccurate depictions of how for instance different units work, or what the impedance on different lines is, or is it a function of the fact that you have bad data on what a different unit is actually doing in real time.

MR. BRITTON: No, no.

MS. SILVERSTEIN: What you've got built into the model or the data that you're feeding into the --

MR. BRITTON: It's not the real time data that I'm talking about here. It's the underlying model and it goes to all aspects. It's how the system is connected together in reality, what the actual characteristics of units are, the impedances of lines, the modeling of loads.

MS. SILVERSTEIN: So to be very clear, what you're talking about is not data quality so much as the quality of the assumptions? Now those assumptions may be built on data that you can't get your mitts on, but --

MR. BRITTON: Sure. There's a large quantity of static data, what is sometimes referred to as static data, that's loaded into the system to represent the power system.

Yes, sir?

MR. HEDERMAN: Let me jump in. If I'm

understanding you correctly, you're also talking about the functions and the solutions and it's not simply the data about it, but it's how you're solving as well, that is part of what you think is needed to get to be accurate. Is that correct?

MR. BRITTON: It's part of it, but as a for instance, the State Estimator contains, is a function that tries to minimize the difference between measurements and model. And the objective function of a State Estimator is actually a measure of model quality. It's how, if your measurements were perfect, okay. So it would tell you how accurate your representation of the power system is if you tracked that through time.

MR. HEDERMAN: Is there a model today of the kind of quality assessment that you're talking about?

MR. BRITTON: Not to my knowledge. There are of course lots of State Estimators running, and individual engineers who work on those State Estimators I think probably take more or less care with going back and correcting models and trying to improve that objective function. But I'm not aware of anyone who has ever done a scientific evaluation of what was a good objective, what was a good estimator, what was a good model. And I think it's probably high time we do that.

MS. SILVERSTEIN: I'd like to take the MC's

liberty of suggesting that we put in a marker for discussing at some future point, after we go down the row, let's come back to the question of what makes a good estimator and what are the vulnerabilities of that and how do you make an estimator model better. And let's wrap up your list of high leverage areas for standardization.

MR. BRITTON: Well, that was my last item and my closing statement is simply that we need a standards process of course for dealing with this. We need a neutral forum, which has a proven process. We need to have an interest group that is focusing on these problems and working groups and so on, probably staffed voluntarily by parties who are interested.

And once we get a standards process in place, it should also have a lot to do with prioritizing the propositions. And some of the things I've mentioned like just creating open access to applications and to data can be accomplished almost immediately, because they are not technical problems. Or at least I say that optimistically. Thank you.

MS. SILVERSTEIN: Thank you very much. Mr. Alsac?

MR. ALSAC: Webster's dictionary defines "standard" as something established by authority, by custom, or general consent, as a model or example, and gives things like criterion, yardstick, touchstone, as synonyms. On the other hand, "guideline" is defined as an indication or outline of policy or conduct.

Based on the time constraints we are facing in the development of markets, most of which should be operational sometime next year, in the development of these markets, I am more inclined to adopt the guideline definition for the present purposes of SMD.

Question: The first question is: What should be standardized? Or what should we have guidelines developed for? To keep innovation, competition, and healthy technological progress, we should direct our attention to standardizing, first, market design, then data requirements

and modeling-related issues as mentioned before.

Together with mandatory, open-system architectures that will facilitate plug-in market-related software -- this involves standards or guidelines for market definitions, market designs, market data requirements, and data exchanges between market -- different market systems and subsystems, electrical networks and their market models, and open-system architectures.

Second question is whether there should be a standard data model. The experience has shown that it is very difficult to come up with detailed data models or data dictionaries, et cetera, that cover all the implementations.

Attempts for these in the past, for example, by IEEE, by EPRI, ended with limited success. Again, such standards are useful, as long as they are simple and are used as guidelines. If we go into very detailed descriptions, it will take a very long time, and it will never be complete.

The third question I have is the potential for developing datasets to benchmark the needed software. Dataset were developed, and, by default, adopted by IEEE in the early days of electrical network solutions by computers.

They were limited in features, but helpful in establishing some benchmarks, mainly for software developers. Similarly, developing datasets to benchmark

market software may be helpful for the software developers today, and will definitely instill some user confidence in the software.

However, market software is very complex, with many different features and it is not easy to provide benchmarks to cover all the aspects of every application. Again, it is recommended that we should not try to standardize in great detail, but to have guidelines and see how those guidelines direct the development of the standard market design.

Furthermore, software benchmarking is an area which we should be very careful to do fairly, considering all the different factors, not only for software, but other things like hardware platforms, compilers, measuring similar models of similar applications, in short, comparing apples with apples. This is usually a very difficult process, much more difficult than it sounds.

The final and fourth question I have is the need for user-friendly, transparent interfaces that will help instill confidence in the process. In my view, confidence in software is best instilled by explaining its functionality to the people who are going to use it or be affected by its use.

For instance, we need to educate market participants in market-related issues in order instill

confidence in the market software. Unfortunately, this is a process that can take a long time.

Another way to inspire confidence is to provide stand-alone software, not integrated into the ISO systems, but stand-alone software, which market participants can use independently for learning and simulating the ISO RTO software.

For this purpose, we need ISOs and RTOs to publish their data correctly, completely, and consistently, as frequently as possible. Standard market design initiatives should definitely cover this in its scope. Thank you.

MS. SILVERSTEIN: Thank you. Dr. Irisarri?

DR. IRISARRI: Okay, thank you. Most of the issues, of course, have been addressed already, but I would like to reiterate a couple. Personal experience, interfacing with RTOs to simply look at the data is being published today, indicates that there is no standardization whatsoever in market participant access to the RTOs. If you go to the websites of the New York ISO, New England ISO, PJM, you are going to find a completely dissimilar presentation of the same information.

The access mechanisms to that information are completely different in each of those three cases. Just to give you examples, if you want to download a piece of

information from New York ISO, you have to use a totally different mechanism than if you want to download the same information from PJM or others.

That kind of interface, that kind of a standardization is actually the easiest standardization. It is a lot easier to standardize those components than to standardize a data or to standardize a programs or to standardize interfaces, as a matter of fact, between those programs.

So, we suggest that that would be one of the important concerns of the FERC and its staff, to look into interfaces for the market participants and market users that facilitate the provision of data to the systems, as well as the downloading.

Data availability, of course, has been mentioned more than once. That's a very important concern. All of the not only market participants but software vendors are very interested in having access to data that can be accessed.

Of course, there is always going to be a certain amount of private, secured data that belongs to the different participants. That is harder to provide in the real-time. Maybe it can be provided later, but data availability is particularly -- data to do the calculations or to design the programs to do the calculations necessary

to support these systems should be a main concern of the Commission.

The issue of system size: We, as providers of software, are being imposed very serious requirements as far as developing applications to support system sizes that may be exceeding any of the system sizes used today.

Of course, efficiency of markets requires economies of scale and integration, but at the same time, that is going to pose significant problems and solutions. So, there is an need to decide how big is big? A system of the combined size of Southwest Power Pool, Midwest ISO and PJM is a very, very large system by any standard, and any kind of solution, including nuts and bolts, and so on, will be very highly challenged for a system of that size.

On the other hand, if you have a set of RTOs operating independently, you have another problem, which is the intercoordination of those entities and the various issues that come out of that process, such as a loop flow, different pricing computer for the same location, by different entities and so on.

Therefore, a coordination to deal with the seams problems and to deal with system reliability and system security is still a big concern and should be there as part of the system in the aspect of any design.

Finally, another issue we've been wrestling with

for a long time and was mentioned by Jay and Ongun and probably everybody will deal with this one as well, is the modeling concerns. How accurate is accurate, and what is accuracy versus precision? Do we need the precision necessary by solving very complex, what is called AC solutions, or is the accuracy provided by the linear models or DC sufficient?

Our experience in operating -- designing, implementing, and operating the IDC, which is a purely linear, so-called DC model, has indicated that it is accurate for the intended purpose.

Now, that is a loaded sentence, intended on purpose, and we have to see what is the intended purpose of each and every one of the applications that are going to be implemented as part of the standard market design, and, based on that, decide what kind of a model is needed? Do we really need an AC solution? Do we have to model every single phase shifter in the system to a great level of accuracy, DC models, et cetera?

We have wrestled with these ones, these issues for a few years now, and have developed quite a good understanding of the issues, and it always poses a big challenge.

Finally, the last point that is of great significance, given the events of the last few years, is

system security. And there is access to the system in a secure, authenticated, manner, and the means to do so, based on the available standards such as SSLX.509 and efforts that are being conducted by NERC and other organizations.

So, I just bring those points for additional discussion, as we move on. Thank you.

MS. SILVERSTEIN: Thank you. Mr. Finney?

MR. FINNEY: Thanks. I'll be brief, because I echo many of the comments we've heard already. As the standard market design discussion continues, including this morning, a number of questions have been raised, including the technological capability of supporting very large RTOs fashioned after the SMD.

BAsed on our recent testing and deployment experiences, ABB is confident that today's technology is up to the task for both market infrastructure and scheduling applications.

Three commonly agreed objectives of large markets based on the standard market design are: Low- cost, flexibility, and high performance. All of these objectives point to the need for open IT systems that allow RTOs to combine best-in-class applications with a scaleable market infrastructure.

At ABB, we've achieved that with our new SABEL market operations system. For example, SABEL has separated

market applications from the underlying infrastructure, and from reliance on any one vendor's EMS SKATA system, including our own.

Our current SABEL deployment at the Korea Power Exchange combines our market operations system with an Alstom EMS SKATA system, and supporting applications from multiple vendors. The rapid progress that we've made on this project and on the product line indicates to us, a replicable model for market implementation here in the States.

ABB asserts that open systems will only be realized if both markets and vendors maintain the strict adherence to rapid development and adoption of standards, which, as we can see, a consensus is forming here today already.

The common information model, you know, CIM, has already proven its value in the exchange of static network data. CIM, however, needs to be extended to encompass all the information relevant to standard market operation.

In addition, real-time data exchange standards like the one that is supported by both ABB and Alstom, should be promoted by the larger community of users and vendors.

ABB encourages the FERC to take a firm stance requiring standards development and adoption. Without such

efforts, the true appearance of modular components will be delayed.

We welcome and appreciate the FERC's recent inquiries into the ability of today's scheduling applications, including State Estimators, to handle the challenges presented by large markets, based on the standard market design.

I'm happy to report that recent tests completed at the New York ISO confirm that day-ahead scheduling for the combined Northeast markets, using our own latest security-constrained unit commitment program, were very successful.

For State Estimators, I mentioned earlier, the challenges that standard techniques common to the EMS industry often lack the robustness to converge reliably for market operation, but our recent experience at the Ontario IMO leads us to believe that these problems are quickly overcome, once there's a market impetus to do so.

Finally, as mentioned by several of the others here today, we want to emphasize the importance for accounting of the market participants costs. From our own experience, deploying market communication and information management systems for the participants, we know that the costs that participants incur to interface with multiple markets can be staggering.

Now that standard markets are becoming a reality, we need to ensure that vendor and RTO efforts at standardization extend all the way to the end user.

We're committed to this effort and look forward to working with the markets, the vendors, and the market participants to cement standards in this area. Thanks.

MS. SILVERSTEIN: We understand that you guys won't do this unless you get paid, and we understand that market participants, including ISOs and RTOs, won't do it unless they get paid, so we've got that one handled. Thank you for your concern.

But that, of course, is one of the reasons we're committed to standardization, is to try to make those costs lower and more cost-efficient for all of the participants, including, most fundamentally, the customers who end up picking up all of your bills.

MR. RISTANOVIC: I would like to start from a short look at the current situation of large ISO-RTO systems. If you take a look at what is there in the field, what this country is in the process of building, they're talking about a large, complex, custom, one-of-a-kind systems.

And due to the unique nature of these systems, they all have high startup costs, high maintenance costs, very difficult to change, which all has implication on cost

and schedule implementation.

And that's pretty normal for systems as young as many market management systems, because we should not forget that the EMS system is almost 40-50 years in operation, and they are quite mature and we know how these operate. And these are kind of young systems.

What didn't help for the current system is that it didn't have SMD, so it was a high-cost of market design for all of these systems, which is very expensive. Resources for doing this and the process of trying ideas and errors is very expensive and time-consuming.

So, we see that by introducing SMD, that cost component will be eliminated, because people will have very nice, specific, precise framework to avoid that high startup market design and trials and errors.

And for that we need a reasonable level of details in SMD to make sure that there is not too many deviations. Of course, always take into account, specifics for individual local areas that have to be taken into account, that they are of no importance for some other areas.

So we believe that SMD can greatly improve the situation for existing and new RTOs, ISOs, and will have great impact worldwide.

Now once we establish kind of standard framework

for energy market management systems, immediately comes another opportunity. Since we have defined large functional blocks, there is additional savings that can be realized.

If we start looking deeper in this major box we were talking about today, very quickly we can identify smaller functional blocks, the same smaller functional blocks that is in all of these components. I will just give you one example:

You will find network applications as a group of functions in FTRs, in day-ahead market, in real-time market in State Estimator, almost all over the place in all these major blocks. And that immediately gives you an idea of, well, why don't we use the same component in all these major subsystems?

It's beneficial to use the same model. It can reduce the cost. And it will guarantee compatibility of the solution of these different timeframes.

So we firmly believe that there is a lot of room to standardize smaller functional blocks, which will greatly reduce amount of work and integration effort in the system.

Another important aspect is if you look into, let's say day-ahead market, real-time market, in standard market design, we will find security-constrained unit commitments, security-constrained common dispatch. But guess what?

If you configured security-constrained commitment with some set of flags, you can switch the same engine to be security-constrained common dispatch. So once we identify these functional blocks, maybe another next step of interest would be to define configurable parameters to use that block in different functional environments.

So we see a lot of potential there that I'll address later, how that impacts all integration costs, and how that reduces risk for implementation.

Another important aspect, in our opinion, was what was addressed by all of the participants, practically, is standardization of data model and data model exchange. And we highly recommend that SMD adopts EPRI's seam as a foundation for SMD standard model. Of course, we have to identify missing parts of the model that are not in the seam, which are necessary to support operation of a market management system, add those extensions and expand the model.

Once we are through this stage, once we have functional blocks that are well defined, well encapsulated, naturally, what will happen, what we see in the EMS systems, is that a complexity of modeling and functionality is encapsulated, and what is going between these blocks is a relatively simple interfaces and low amount of data. That is what we saw in traditional EMS.

We also find out that many of these components will be exactly the same components that we used for years in EMS systems. That's why you will frequently hear that these energy market systems are not that new; there are just a few new components like OASIS, e-tagging, FTRs, that more or less everything else was there, just put differently together and used in a different way.

So we believe that it is a relatively easy and quick task to identify exchanges of data and scenarios, work flows between these functional blocks, which are at a lower level of detail than these large day-ahead and real-time markets.

And that would another suggestion to think about as a possibility for standardization. We fully agree that these systems, especially taking into account, events of almost a year ago, have to be very secure systems. Size doesn't help, getting bigger. It's more vulnerable to problems.

So, we see a need for establishing some standardizing in security requirements and security platforms.

And last and not least, of all of these functionalities you're talking about, we see different kinds of problems in different aspects of energy market management systems.

On the one hand, the real-time systems, we don't see many problems in scaling and sizing. We firmly believe that it would be problem for these large systems to keep State Estimator running continuously. You can bring it up once, but then continuous maintenance of data model is a headache, and we have seen that problem much more since what we're talking about large RTOs.

In the day-ahead market, we see another, different problem. We were never big advocates for unit commitment for day-ahead market, and I have to repeat that on every occasion. It doesn't help my company, but obviously we have to live with that. It is going to be an SMD, and Siemens has invested a large effort to develop new security-constrained unit commitment. We have a large nodularization, but we developed mixed-integer programming approach because we were not happy with quality, robustness of our solution.

However, unit commitment is a tough program. It's especially the kind that we're talking about these large markets. An interpretation of results of unit commitment is even tougher problem.

The only way that we know how to measure quality of a solution is to covert to algorithm nodularization, but that's still not good measure. We may have better nodularization.

So we have something that we feel is good, but we don't know how good it is, because there is no reference point. You can easily see if your state system solution is good or not. I mean, you can measure that.

People who know how to can do it, but it's very difficult to conclude how good is your security-constrained unit commitment solution.

Another problem with security-constrained unit commitment is that with different set of constraints, difficulty of problem changes. If you have single-segment price curves, it's different problem than if you have multiple-segment price curves.

If you have up and down, short up and down time constraints, it's different than if you have long up and down time constraints. And these changes are exponential or higher than that.

So having all this in mind, we firmly believe that to answer all the concerns about visibility, repeatability of solutions as you will see for day-ahead market, we have to establish a benchmark test of reasonable size. I don't know what is reasonable, I mean, maybe 2-3,000 units is close to be upper level reasonable, and publish that model so it can serve as a benchmark to validate existing software, and at the same time, you can encourage other developers to keep improving, because unit

commitment -- like, take ten years ago, our big problem was 50 units, and we were targeting that market.

What we are talking about is huge, and none of us, I don't believe, had enough time to develop a good one, the one that is as close as some traditional software. So we need these to encourage other developers to keep improving these important functions.

So this is more or less a list of things that we see are good to be standardized, and we don't believe that we should standardize any implementation, any specific software platform. And this standardization of user interface is on the border, because it's very difficult to standardize user interface and not to standardize any permutations, so you have to be very careful in standardizing access to market information by market participants.

MS. SILVERSTEIN: Ah --

MR. RISTANOVIC: I'm running out of time? Okay, I'm just going to quickly -- I mentioned -- I would just make one more point; that once we define these functional block, we have everything ready for -- and standard data, we have everything ready for modular, open-access system.

And in the afternoon, we'll share some ideas how this process of standardization can be speed up to be on time for existing and coming RTO systems.

MS. SILVERSTEIN: I compliment you all on talking about a single topic and having many, many different and complementary things to say about it. I think we've gotten a good overview of standardization and the needs, as well as a lot of support for commonality.

I'd like to start by asking a question about the difference between open architecture and standardization and guidelines, and the degree to which -- how do we do that without stifling innovation in how you make things work and how effective the model is? And yet, how do we assure that anyone of these models can plug into and take the feed from one and be integrated with the others in real-time operations? Is it benchmarking? How do you making open architecture and systems happen is an entirely different question, and that will be my second and followup question. Anyone who wants to tackle it can go first.

MR. FINNEY: You raised a good point. How do we encourage rapid performance so that we can deploy these systems quickly, with the assurance, when we start them, that they're going to finish on time, without stifling innovation?

And the key here is we need a clear distinction between functional requirements of what the black boxes do and the supporting models of how they do it. I may have misheard, but earlier today, I thought I heard, you know, an

attempt to standardize methods and models that we will use inside of approaches, such as State Estimators and real-time schedulers.

I strongly encourage against that; rather, if the markets themselves can reach a consensus of an interpretation of the SMD that can clearly state what are the functional requirements of each of the components, and then, of course, the vendors sign off that that is a vendor-neutral approach to the specification, then we can chase our own profit motive to do what we do best, which is to innovate and to chase those specifications.

Would that end the benchmark of data sets that represent actual markets in operation today and, you know, includes together markets to represent larger RTOs I think is a good first approach toward establishing the benchmark data sets that we can tell whether that's working or not. Did that help?

MS. SILVERSTEIN: So you use the benchmark data to validate that you're putting the same data in and you're getting the same result out regardless of what's inside the box?

MR. FINNEY: Yes. It's not quite as that, of course, in practice, but we have to start there first.

MR. BRITTON: I'd like to go back to your open versus standardized and try to first of all paint -- what I mean by "open" is a view in the case of a particular application, and I recommend looking at this application-by-application and looking at the boundary between that application and the rest of the system, so that the rest of the world and the application are the only things you're talking about. You're describing what the information is that is transferred to the application and from that application.

And "openness" means that that information is there, available to another vendor, so that that vendor could write an alternative version of that component and

plug it into the system.

It doesn't mean that it's there in a standard form. That component vendor who might want to have a competitive version of that module might in the case of one system vendor have one definition, and in another system vendor, have a second definition.

In this marketplace, though, there aren't that many combinations. And in terms of cost effectiveness, you get most of the value of open competitive supply simply by making sure that everybody's interfaces are available for use.

Standardization is -- it changes the picture. It adds some value in the fact that you can write only one interface, but it costs quite a bit to achieve. And it also can, in some situations, act as a constraint on the development of better algorithms. And in certain situations, it's probably justifiable to go farther. But I think we should be cautious about going farther and eager to go that first step of openness that achieves a lot very easily.

MS. SILVERSTEIN: Mr. Ristanovic?

MR. RISTANOVIC: I had a couple of years opportunity to discuss with Jay at forums, and we have a small difference of opinion in this respect. Opening interface is a good first step. But that means that Siemens

as a vendor has to have interface for ABB, Nexant, OATI, ALSTOM, all of this. When you have standard interface, we have one interface to all of them. It's a small distinction. And I agree with Jay, we're talking about a small number of components, and that's why I think it's not a big deal to switch from open interface to a standard interface.

You raised a very important question about standardizing but not preventing competition. By properly defining functional blocks, you leave a lot of room for competitive improvements of components. Because this interface again, a very small part of the business, that are just making plug and play easier.

MS. SILVERSTEIN: I assure you that this agency is all about promoting competition and open access, and we would not want Standard Market Design to promote monopolies or create monopolies and barriers to entry.

MR. IRISARRI: I would like to give one example of a standard that is available to everybody and everybody can submit their own solution, their own little mouse trap and be successful if they want to, and that's the Italian standard that was developed by NERC and the NERC committees.

That standard defines in complete detail what an electronic tag should contain, how that piece of information should be exchanged between different parties, how should it

be manipulated and process. It doesn't say how I as an implementor have to do it, what sort of a database, should I use seams? Should I use some other database definition? It doesn't say anything about that. It's external set of interfaces.

Now anybody can write code to support those external interfaces and be successful if they want to, and we have seen in the industry that that is the case. There are many providers of services to do electronic tagging. That's an example. And that is a very complex, very complex system that encompasses the whole of North America and is active 24 hours a day, seven days a week.

And it has to be very, very, very reliable, because it provides information to two main market-related operations. One is the exchange of energy. Second, the congestion management of the system.

Now how can that be accomplished in this case? It can be accomplished perhaps in a manner along the lines of -- I have to agree with Jay Britton -- you have to publish interfaces so smaller vendors -- and I'd like to put myself into that category -- can come in with an application, say, security constrained dispatch for the real time, and implemented within the larger context of an EMS provider.

And if we know what data can be extracted from

that system and in what format is the data going to be available to me, the data that is needed to do this calculation, then I can access the data, and if they tell me your answers have to be provided in this format and this is the set of interfaces that you have to use to provide your answers into a system, then we have a first step towards an agreement on how to implement that software.

MS. SILVERSTEIN: So what you're saying is, give me the data set and give me the specs for -- the data set to feed into it and the specs for what has to come out of it and tell me what I can and can't do in terms of assumptions inside the box, and I'll build a box that will take the data and give you the result in the output format that we need?

MR. IRISARRI: That is the principle in a nutshell. And we have had that kind of experience with some of the vendors here, particularly ALSTOM. We are co-providers of systems at Midwest ISO, and we agreed with them on interfaces, and we can get the data and we can supply the results. And it's possible to do that and thus allow competition and allow the ingenuity of the different providers to come through.

MR. O'NEILL: I'd like to change the topic slightly. I know all of you folks have been working very hard at implementation of you intend or what you think SMD is going to be. Could you just tell us what your current

capabilities are, what kind of progress you've made in solving large-scale problems, what kind of timeframes you can solve them in? And if you want to, tell us the type of computer you're solving them on, and address the barriers that you see coming with larger systems, larger RTOs, larger markets, which the Commission has essentially championed?

MR. FINNEY: Well, I'll start with an easy one. I'm just going to reiterate the point I made in my opening statement. Actually since the survey results that we provided to you about a week ago, we got very reassuring news from the New York ISO which completed its last round of testing to see could they, or what would be the effort required to schedule a much larger market based on that current system.

What they did in that case was to obtain the data from the surrounding ISOs in, by the way, CIM XML format, which made a lot of the standardization issue went away right there.

Then they deployed our basic algorithm on the fastest hardware they had available. I apologize for not knowing what that is.

MR. O'NEILL: The surrounding ISOs being IMO, New York, New England and PJM?

MR. FINNEY: Actually this afternoon maybe we can get some correction or some help from New York in the

audience, but I believe it was just PJM and ISO New England. There was some bus modeling into Ontario IMO, but the generation bids terminate at the border.

And the good news is, the size of the system was about three times the size of the system that they started with, and they report that for their various experiments to solve times for the day ahead unit commitment, the security constrained unit commitment, were about three times as long. So that the SCUC itself, which is where we address, where we really hit the mixed integer problems, where we worry about it, that was able to converge in about 11.5 minutes with the overall scheduling timeframe falling in well within under an hour, excluding, by the way, some statistics I don't have about transfer to and from the commercial side of the system.

But the problem scaled approximately linearly. I need to point out that this is one specific problem and of course it's not generally applicable to everything, but at least it's one piece of hard data that we've seen that suggests that continuing doing what we're doing with faster hardware and tweaking to the algorithm as needed are already ready to support this.

So if I were you, I would not hesitate -- or rather, I would not attempt to limit the size of the RTOs based on our capabilities, at least in terms of the day

ahead schedule.

MR. IRISSARI: I would like to tell you about our experience in developing basically systems to support the Standard Market Design. For the past two years, we have been working on the development and implementation of a complete system including database requirements, user interface, and of course the software to support the auction calculations, including options and obligations, and including point-to-point rights and flowgate rights.

We have also developed a complete software to do the real time security constrained dispatch, and we have done some work in the day ahead market. We don't have at the moment a completed security constrained unit commitment, but have a developed related dynamic dispatch calculation which is pretty much is close to the unit commitment, but it doesn't have the same level of complexity.

And I'd like to mention some of the parameters under which we are working. We used to do all these calculations de facto standard, which is the PSSE MMWG case. Everybody has access to that case nowadays. It's a case, a powerflow case, that's our source of data. That's in lieu of having a real time case you have to start from a powerflow model. That case has a total size right now of about 40,000 buses, electrical buses, some 52,000 branches and 6,300 generators or so. So it's an Eastern

Interconnection model, a very complex, large model.

On that model, we do calculations such as the security constrained dispatch, and I can tell you that we can solve a security constrained dispatch within a two-minute period calculation from reading the data from the database, processing the data and writing the results, back to the database, less than two minutes. And typically we are considering on the order of 3,000 generators there.

The number of constraints, the network constraints, is over 1,000 flowgates. And we use the main flowgates as constraints, and there are 1,200 constraints in the Eastern Interconnection right now that I model as flowgates. Some of those include contingencies. Half of those include contingencies. I have 600 contingencies represented in this problem and we do that in really destktop type hardware, 800 megahertz, about 512 megabytes of memory in two minutes.

Similarly, we have an auction solution. The auction solution is a complex problem, as was mentioned earlier. It takes on the order of 10 minutes to solve for a total of 14,000 bids, these are the FTR bids requested by the participants, of which 10,000 are obligations and 4,000 are options.

We have about 12,000 point-to-point rights represented in this system and about 2,000 flowgate

rights.

This is a linear programming problem, as was explained earlier, has linear objective function. We are maximizing that, and linear constraint. So it's a very large linear programming problem. We solved it in about ten minutes. That would be one execution of that problem. Of course, that problem, even though it can be solved quickly, is a problem that has to be solved many, many times during the auction process which may last days.

So details on certain calculations, for example, the main type of item that is used in representing constraint is what is called generation shift factors or load shift factors. We can compute those for the whole Eastern Interconnection system, that is 6,300 generators and 1,200 flowgates in about 25 seconds right now in the same hardware, which is actually a desktop hardware.

And I guess that summarizes our current experience with calculations and integration of this software.

MR. O'NEILL: Do you see any barriers?

MR. IRISARRI: Of course. There is always a barrier when developing software, no matter how big the computer is. Sooner or later -- it's like the closet at home. Sooner or later you fill it in with whatever you have.

(Laughter.)

MR. O'NEILL: How much space do you have in your closet?

(Laughter.)

MR. IRISARRI: Okay. I believe that we can solve -- the main barrier in our experience is going to be t he data here, data provision, and that is the State Estimator. Why do I think so? If you consider, I don't know about IMO, but I know about SPP. SPP has perhaps the largest State Estimator right now in North America, and it is 12,000 buses. I know that that State Estimator is not running at the frequency required to do the real time calculations of the security constrained dispatch in real time, which is five minutes, as expected.

If they get a solution, they probably get it within the hour for 12,000 buses. Now scale that by a factor of 3 or 4, which is going to be the objective of the model at, say Midwest ISO, PJM, SPP combined, the complexities are very large. So I see a barrier right there in the provision of the data.

Now without the proper data, we fall into the syndrome of garbage in/garbage out as discussed earlier. Now one possibility -- and this is an experience that we have had -- is instead of trying to solve the whole problem as one solution based on raw measurements, it appears

logical and reasonable to integrate solutions provided by the different regions that compose the larger market.

For example, PJM is solving its State Estimator right now. It's much smaller than PJM, but it is solving. SPP will probably solve with some effort, and MAIN, which is another significant component of MISO, may solve. MAPP is the other component or TransLink nowadays, they may solve a smaller State Estimator, 6,000 to 7,000 buses.

It seems to me reasonable once you have put all this effort in computing each one of those and maintaining and purifying and validating and checking, to integrate those solutions. There are algorithms that can be implemented that can integrate that solution and find then the large solution for the whole of the region to be used in the next steps.

MS. SILVERSTEIN: Clearly that is what you have to do as a workaround I guess in order to live with what you've got and what you're able to have, but the drawback to doing that that we would like to surmount someday in the future is that we will always end up with suboptimal results, and we will be perpetuating seams in operation. We will be underestimating what we can transfer from one region to another or perpetuating or creating contingencies that may not be in fact materially important for grid operation.

So I guess we have to live with it, but we want

you guys to keep building the closet bigger so that someday we can avoid that.

MR. IRISARRI: Just to clarify here, I'm saying that this solution that we are after is for the whole system, and it would be equivalent to the solution as if you had computed it for the overall. It's just that the integration process of the solution has to be done properly such that the answer is equivalent as if you had solved it as one, unique large system. Is a hierarchical process of integrating the solutions without compromising on accuracy.

MS. SILVERSTEIN: Did anyone else want to tackle Dick's show off your statistics question? Mr. Britton?

MR. BRITTON: Show off my statistics, huh? Well, first of all, I want to question the SPP State Estimator information. I don't believe that that's the correct current result down there, but I can't quote the numbers. So I'd have to take that one off line I guess to figure it out, but it is one of our systems.

MR. O'NEILL: Is that your State Estimator?

MR. BRITTON: Yes. That's one of our systems, so I don't want that to stand uncontested.

(Laughter.)

MR. BRITTON: We've been running more generally, of course, we've been concerned about the increase in size and we've been running tests. I mean, we've run for

instance 25,000 bus State Estimators that are in the 15- to 30-second range, and real time dispatch in the 12,000 bus system range at 20-second solution times.

We have results that give us confidence in saying we can move forward, we can move upward in size. We're not at the limit. We are pushing our technology, and we are creating some challenges, but they're not -- I mean, so were we all the way this process, and I don't think that we have created something that is an especially high barrier here as long as we recognize that increasing size does create some challenges.

I also would like -- I used to do network analysis, but these days I do more system design, and I would like to say here that a lot of the challenge is often not in the particular algorithm but in the overall movement of information through the system. When you're dealing with a 12,000 bus system as compared to a 2,000 bus, it's about six times as hard to get your arms around what's going on in the system when there's a problem.

Visibility of the system to users and to debuggers of the system becomes a problem. Going back to the data issues, if you make an RTO with a very large footprint, what you've done is increased the number of sources of data that are being combined at the modeling level, power system descriptions, and you've increased the

number of sources that you're combining in the SKATA sense, so you get more time skew in the SKATA information.

And there are a lot of fairly mundane kinds of problems at low levels that get bigger and bigger as you go on. And we should be paying as much attention in those areas as in algorithmic.

MR. ALSAC: Again, we have done some of our experiments. We had created a Northeast ISO size system comprising New York, New England, PJM, run those tests, and we have of course done -- our State Estimator is running in Maine, which is one of the bigger State Estimators, and we extended these data. We extrapolated existing results to much bigger systems, et cetera.

And really, for the type of software we have, we have all the market-related software except security constrained unit commitment, we think algorithms and software technology can handle the existing ISO, RTO type of applications, and they are scalable to provide acceptable solution times for bigger systems.

Again, as everyone indicated, there are limits to this, but also the performance increases with number of faster computers. Like everyone, we did all these tests using desktop computers which are much different than some of these multi-CPU servers and other things which are faster. And with number of processors going up of course,

there is a possibility of getting some kind of increased performance.

The main problems we see, like everyone else, is based on our past experience with EMSs of smaller size and now EMS with RTO-ISO size, is really poor measurement quality, poor redundancy, unsatisfactory data quality, poor data exchanges, which are format and content incompatible.

That results in either not working state estimators, or poorly solved grid models, which is, again, provided by State Estimator to the rest of the other market applications. I mean, once the State Estimator model is bad, everything is based on it, and then everything follows that, and that will be bad, so this is, we see, really, a major problem that, as the systems grow, I think attention to data problems do not grow proportionately. There are committees drawing data together, expecting ISOs to make it work, rather than very detailed analysis making the gaps between existing areas and multi-area, multi-region ISOs are lots of gaps of data that's not provided.

There are still ISOs where State Estimator is not working, and will take time to work, and like they are -- I was in some -- I was hearing in some meetings that California ISO State Estimator will work by the end of the year, and it has been the same story over the last couple of years. And it is, again, not due to algorithms; it is not due to software technology; it is the data, missing data, and bad data that is provided to these algorithms.

MS. SILVERSTEIN: Perhaps we could take the data quality issue, as well as the benchmark data issue and put them aside and bring them back in our closing session of the afternoon, where we're actually going to be talking about what do we do next and what are the priorities, and who needs to do them?

MR. ALSAC: I think that's an excellent idea.

MS. SILVERSTEIN: Thank you. Mr. Ristanovic.

MR. RISTANOVIC: Well, in the answer to the question about the expression about anticipation of SMD, we didn't spend much time on SED real-time State Estimator. Everything is fine there. We tried up to 30,000 buses, a good number, sequence, one-minute cycling, five-minute real-time market, so we don't expect performance problems there.

We fully agree that the quality of the data is the key issue there. Again, not to bring it up first time, but to keep it running. Because, the first time, while we are their vendors, we can clean data, find what the problem is. Once the utility take over -- not all of them, but some of them are pretty good about that. I would single out PJM where -- running. They have not that problem, but they dedicated a large staff to maintain the State Estimator, especially when they started expanding the system.

Where we focus our energy with day-ahead market unit commitment, and we are -- we spend a lot of work there

in anticipating co-optimization of energy services, interruptible load bids, those were major efforts that we put in place, and parallelization of mixed-integer programming solutions.

So, we are pretty pleased with what we see, how it scales for our PCUs, because it's part of the methodology, and that's our main effort, to improve robustness and quality of solution of day-ahead unit commitment; in other words, the same question has to give you the same answer.

MR. LUONG: I think so far we're talking about the size of State Estimator and everything, and the size of the system. And I think the next thing I would like talk about is the battery of the RTOs. I mean, I've been to school and I worked in State Estimator, and I learned State Estimator and I know that running the State Estimator -- solving the State Estimator in the lab is easy, but running the State Estimator every day, 24 hours a day, is much harder.

So, now, you don't have -- you have State Estimator solution and you may have things like that. Now we go to the next step, going to the security-constrained dispatch and security-economic-constrained dispatch.

What happen if your battery is in a situation that you cannot get a solution? Because of some of the

units that you need to be in that is out of your controlling area, and because of the configuration of the RTO right now, you may run into the situation like that.

The unit that you want to move would be outside of our authority, and this one will give you the situation just like Alison just mentioned. You become the suboptimal, you know, the electrical island. So how do you solve that problem? You see that the battery of the RTO would be a problem.

MS. SILVERSTEIN: The only good is that we'll be perpetuating commercial seams and obstacles, except for technology insufficiency reasons instead of official, formal market player barriers and opposition.

DR. IRISARRI: Always, that's a hard question to answer. But perhaps just reflect the expedience -- today, as we know, because of all the reasons that have been brought up, State Estimator fails here and there. Even power flow fails.

As we increase the size of the system and as the data requirements become more stringent and the data qualities become poorer, as the integration of all of these systems tend to fail, then we -- the State Estimator itself may not be able to solve or may not have a solution for the whole area of interest.

In that case, what is necessary to do is the same

things that are done today: Is to extend the area of interest by pseudo-measurements or other information that is previously obtained through the history of running the system, and replace the lack of real-time data. And that is done today for the external systems by statistically-equivalent and reasonable information.

And then you would have a solution where you can incorporate the missing piece, say, a generator or a load that you have to provide. You cannot just throw up your arms and say I cannot continue. You have to obtain a reasonable solution, given the approximation.

Now, that touches on what is done today, say, for a real-time system such as the IDC, which is not using real-time data; it's actually using a power flow mode that is kept as close as possible to real time with information provided continuously, such as altitude formation, changes in equipment, transmission equipment, and as well as generation equipment and so on. We kept it up to date as close as possible to reality.

The same thing and the same sort of process has to be used to deal with real-time problems, and it's being done to a great extent now. That's my take on it.

MS. SILVERSTEIN: So, operational -- I'm still stuck back at the surprise I felt when you all said, oh, we're only running the State Estimator once a day, because

it's our practical experience that, you know, power plants and lines go down pretty much when they want to, and that the condition of the grid at the point of time when you've got all your EMS in, and you're saying this is what it looks like now. I'm sort of stumped as to how you then -- I mean, you build your unit commitment, and you've got a pretty good idea of what's going to be happening, based on your day-ahead, but then life happens.

And is the State Estimator just the building block, and then you're doing something completely different, based on the results of the real-time market? So are you just setting that as the foundation for the day-ahead and doing real-time adjustments?

DR. IRISARRI: Just one clarification: First of all, the State Estimator, I didn't say once a day; I said within the hour, once an hour or, say, every 30 minutes.

The objective is to run the State Estimator as quickly as possible. If you can run it every second or every two seconds, that would be great. Now, today, in spite of not being able to solve the State Estimator every five minutes, you still have real-time information available.

Every system has a SKATA data that is being collected at frequencies of a second -- some of the data. Some of the data maybe 30 seconds or a minute. And you can

actually operate the systems, based on those data, and make some decisions.

But then you run the very high risk of making decisions on wrong information. The whole purpose of the State Estimator is to clean up that dataset and provide, within the bounds of accuracy, a good solution that has eliminated bad data and so on. That's the principle of it.

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For very large systems, as envisioned here, and for the requirements, the economic requirements of a market in which you have to continuously compute price signals, LMPs, as quickly as possible, five minutes is the goal, and that's what's being done today, say, at PJM or New York ISO, and so on and so forth.

Now, for a system such as MISO, of the size of 40,000 buses or so, encompassing, perhaps, parts of SPP and PJM, the expectation that you can run the State Estimator at that frequency, five minutes, at least, so you can run this critical dispatch at the same frequency, is a challenge.

I'm not saying that it's impossible, but it is a challenge, and putting it altogether with all the data requirements and all the calculations that go in and all the data cleanup that goes along, and the interfaces, is where the challenge is, indeed.

And even the algorithm itself, solving a very

large problem, is going to be a complicated process, and then if you fail, if for some reason it doesn't work -- to answer once again, Pam -- you still have to have a way of completing your solution, rather than saying I cannot continue.

MR. RISTANOVIC: Well, it's not a question, can it solve it in the required time; it has to solve, because basic assumption of SMD is LMP calculations. And for accurate LMP calculation, you have to have State Estimator solution.

So if you go higher and in larger models, State Estimator cannot solve every five minutes, and then it has to go every 15 minutes, and then pricing has to go every 15 minutes.

In the case that you're running every five minutes and in some cycle you don't solve it, you can use previous cycles, because you can see assumption is that the conditions are very close or every five minutes, because you don't have anything better in the system.

But you have to have those measures built in the software to take care of unusual situations. But State Estimator, if you make it more frequently running, pricing will be more accurate.

MS. SILVERSTEIN: Have you all or the ISOs done any calibration or validation to determine how often, when

an unusual situation occurs, the folks who are actually doing the ISO dispatch and control, dispatch the solution that the computer tells you to, or they fall back on their seat-of-the-pants, gut-level understanding of how the system works, based on 15 years of experience? Mark, did you have a question?

MR. ROSENBERG: Yes. We've talked this morning about what you're doing and how you're doing it. I'd like to turn it around a little bit and ask the question, what can we do, either through SMD or some other way, to make your job easier?

MR. FINNEY: Alison, cut me off if I'm stealing thunder from this afternoon, but one of the things, basically, don't get too nitty-gritty into the technical details. That's fine, but use your hammer to encourage the openness of the systems, to make certain that standards bodies are in place and that a process is in place, and that the process is not one which is just agreed to by the vendors themselves, but, more importantly, between the emerging RTOs, not just within one RTO, but between them.

How we do that, is what we're going to try to figure out this afternoon.

MR. OVERHOLT: Back to State Estimators, a comment was made that what we would like to do is minimize the difference between what the model says and what the

major data is. What we're working with is, of course, synchronized phase measurement data, and if you had that type of synchronized data on voltages and phase angles, would that be a -- I would think that would be a step toward not a State Estimator, but a state determinator.

MR. BRITTON: I mean, there are a couple of different things that one could look at as improvements to the way State Estimators currently work. I think all the answers that have been given here so far deal with the State Estimator algorithm as we currently use it, where it doesn't take advantage of phase-angle measurements.

But we've had some discussions about wouldn't it be nice if, and certainly the State Estimator needs to be able to take advantage of any information that's available on that. And that information could be potentially very valuable.

There are a couple of other things about the State Estimator that haven't been mentioned also. The size of RTO footprints probably is going to increase the number, the frequency of topology changes, and the usual practice with State Estimators when a topology change occurs in the system is to wait a little, because you don't want to catch system dynamics.

The State Estimator is a steady-state model of the system; it's not a model that takes into account,

swings. So, you know, the question is, when you're feeding more rapid topology changes into the system, is it going to become a problem with the current logic that just says, wait, do you need some way of doing partial State Estimators or using the data that you've got where you can be confident about it to improve it?

You know, there may be some work there that could be very valuable.

MR. O'NEILL: Just a clarification. Do you consider a change in the phase-angle regulator a topology change?

MR. BRITTON: A change in -- on a phase-shifter, you mean?

MR. O'NEILL: Yes.

MR. BRITTON: I don't believe so. Actually, I'd have to check.

MR. ALSAC: We use both transformer taps and phase-angle regulators as state. So we estimate them, if there's enough measurements, so we consider that state, not as topologic.

MS. SILVERSTEIN: Phil, did you have any followup on that?

MR. LUONG: I had a question. We mentioned about information to the market participants, you know, thing like that. You have any desire for the user interface for the

market monitoring to access the necessary data to monitor the market?

I got some feedback from normally the MMU and they feel that they are the second-class citizens in the EMS system in the operation. Do you have any software to design anything like that to help them out?

MR. RISTANOVIC: Well, it goes along with the question from Marvin about what we think about what you are doing. We don't see balanced focus in level of details in different aspects. And market monitoring is one of those that is not addressed in very much detail, together with volatile markets.

So we need more detailed definition of what is going to be market monitoring. And another aspect that is, I think, not addressed well -- I hope it's not a lost cause -- is voluntary market, long-term voluntary deals, which are very important for stability of prices. I don't believe that the ICAP market and the price-sensitive bidding will mitigate, completely, opportunistic bidding.

So those two areas, broader market and market monitoring, are not as detailed explained in SMD, so far as what they see as day-ahead market or real-time market State Estimator.

MS. SILVERSTEIN: As many of you are aware, the Commission's goal is to release the standard market design

proposed rule in two weeks, which means we'll be fairly busy for the next two weeks, and I want to go back to an issue that you mentioned a few minutes ago, Mr. Finney.

You said, well, *bridge tapes 9 and 10* the symbols, but don't make them too detailed. But the nature of my question is this: When we say, here, we need LMP, we need this, we need that, I need you talk more about what the level of detail that you need is or isn't, from us.

And the second thing I'd like the five of you to address is when we give you these rules in whatever the appropriate level -- in whatever level of detail we can get to in the coming two weeks, and refined by the end of this year for the final rule, how -- there is programming and model design is as much of an art, in fact, perhaps more than it is a science, in my experience.

And to what degree can we be assured that when we give you this rule, the result that comes out from a common set of data from Alstom's interpretation of what LMP is, as differs from ABB's, even if you all are working from the same map, how do we make sure that you end up in the same place, and that you don't do interpretations in your design that whether deliberately or non-deliberately, cause different results to actual market operations from the assumptions that you have built into your models?

MR. FINNEY: I'll use your specific example about

LMP. In two weeks, you don't have time to thoroughly vet everything -- if I view the working paper as a starting point -- to put in all the math that's required.

In two weeks, what I would seek to do, first of all, is --

MS. SILVERSTEIN: You need to know that I have a stack of 600 pages at home.

MR. FINNEY: Oh, my god. Well, I'll save some room on my reading shelf. So, if you can remove the ambiguities as much as possible, so when we're talking about LMP, if you say specifically, we want prices calculated nodally, and we would like for the availability of breakdown of price to reflect the components that pertain to energy and to each of the transmission constraints, et cetera.

If you have a view in this area, be very specific. Nevertheless, as you said, multiple interpretations will result, not just among the vendors, but, of course, among the people who will take delivery of the systems.

So, in two weeks, be as specific as you can; remove ambiguities, and then look to establish a process for clarifying issues to be addressed and work on that as fast as possible.

MS. SILVERSTEIN: When we implement and publish the final rule, that with, I hope, with feedback from many

of you in this room in response to the proposed rule, says this is what the level of detail is and this is how it's supposed to work, nonetheless, I expect that when you guys get the draft rule, you'll be going back and talking to your modelers and showing them and saying, look, this is what LMP might look; start working on it.

And the dilemma that I envision is when the RTOs, who are essentially our agents in the field to make markets work, go software shopping, if they start with their common dataset, they will be essentially auditioning all five of you. You'll respond to the RFP, and can they actually -- what if they run it and they say, okay, well, for the same dataset for the same market conditions and players, we've got -- all of it is LMP, very clearly, but we're dispatching Plant A for one hour longer, and we're committing them -- there's a different commitment sequence; there's different real-time run sequences. There's all kinds of stuff that maybe doesn't do great violence to market operations as a whole.

It's still a competitive market; it's still security-constrained dispatch, et cetera, et cetera, but different people are running different stuff at different times, and that affects where the gas goes and where the electricity goes, and where the money goes.

How do we -- assuming that it's not really an

equity issue, as long -- except for the people who aren't getting it, nonetheless, there's some kind of diversity of result. Is that a bad thing? How do we tell how much difference between your results is a bad thing?

MR. RISTANOVIC: Well, if you think about how PJM does it today, they run LMPs and they audit results for different software. So it has to be the same, because they are not the same, one of these two is wrong.

So result should be the same data, I mean, close enough, the same -- results with the same data, assuming that they are either bad or good, have to be very close, and the software has to be audited.

So, from that at point of view, it cannot be compromised, because the party that is losing because of inconsistency has authority to complain about that.

The other aspect about dispatching is different problem. If you have two units which have the same marginal price and they are marginal units, and you unload one of them partially, and fully the other one, that's another problem that is problem of software that has also to be fixed. That also cannot sustain market auditing.

MR. ALSAC: I think even on very simple applications like a simple power flow solution, you will never get the same results by different vendors. So this market software is very complicated, and trying to compare

like the idea that same like an RTO, ISO going to market with the system and comparing, they will never get the same results.

So, I think unless you go into extreme details, which is almost software design, then it is much better to keep your recommendations at higher level, and make the definitions -- I think the market definition, rather than data or software implementation of it, because it is really, in my view, very difficult software. For instance, our software is used to audit something in PJM, but they are never giving the same results.

And it is like almost the boundaries. You can define the boundaries, maybe. It is even a different approach that the software may not give more than this much, but even like the approximations, the methodology, what I am worried is, you can define certain things, but then you will cover the basic lowest common denominator.

And there will be no like room. If you define, for instance, very strictly, data interchanges, then over the next 20 years, it will be very difficult to change those interchanges, whereas maybe adding more to those or changing that thing, you can do much more things, either faster, better, or more innovation. So you have to be tremendously careful in doing some of these things, otherwise, we will all end up with a standard, but a standard may be market

design, but a very substandard implementation.

MS. SILVERSTEIN: But you now touch on a different issue that I would like to talk about more this afternoon, which is how do we assure that standardization does not inhibit evolution and innovation in both the market design and in the underlying software that enables it to work?

But I want to make sure that I understand your recommendation or conclusion on the particular topic of -- it sounds like what you're saying is different software will produce different results, accept it, and instead work with users to identify some level or parameter or acceptable slack within which we can say this is close enough; there are not gross inequities or great misinterpretations.

MR. ALSAC: This is, for instance, how, currently PJM is working with it. Rather than trying to get identical results, which seems to be, whatever you do, impossible, like the data models, representation of transmission lines, everything is in that detail, could be different. And they affect the final solution.

So I think it is better to define the parameters and also to define the market rules that very clearly explains what is required, so that everyone can aim for that. But our experience shows that different software giving identical results, unless it is on a very simple,

like, as have been done so far to test systems. Everyone's results are giving yes, you will get the same results, but on an ISO size, 30,000, 40,000-bus systems with all these complications, there is no way to get identical results.

MR. O'NEILL: We couldn't even get the three-bus systems to work.

MS. SILVERSTEIN: Mr. Britton?

MR. BRITTON: I wanted to echo the comments there. I think he's exactly right, that these are way too complicated to get exact matches.

And I think you'd spend an awful lot of energy trying to make these -- the specifications, and they wind up causing more problems than they would solve.

What might work would be to try to find a way to look for large excursions, and try to understand them, and begin, over time, to get some better benchmarking of quality of results. But, you know, I think that's something that we'd have to set as a long-term goal, rather than something that is achievable in the near term.

MR. O'NEILL: But given this sort of indefiniteness to the process, I would assume that it makes the independence of the market operator very important.

MS. SILVERSTEIN: We probably also need to make sure that generators and utilities aren't using their spare cash to buy software vendors. Affiliate rules take on a

whole new meaning.

Let me close the morning with another little softball question for you. What is the level of precision that we need these models to produce? You mentioned earlier when do you need AC and when do you need DC?

And the extension of that is, how good do these have to be, how detailed do the results have to be, and that also, of course, has implications for the data in, although we don't have to do the data issue now. Mr. Britton?

MR. BRITTON: I'd like to -- there's lots of ways we can go in discussing that question, but I'd like to start it at the State Estimator, because before you can get any of the other solutions, I think you need to just look at how well can you match real-time?

And the State Estimator is the application that encapsules that particular problem. It's a direct test. If you assume that you have accurate measurements, which you don't at any one time, but you, over the longer haul of things, you pretty much have accurate measurements, if you have accurate measurements, the State Estimator differences between measured and estimated are reflecting modeling errors.

And I don't have a quantity. I think what I said in my opening remarks is, I'm not aware of any work that's really been done in the industry about saying how good is a

reasonable estimator? But I think that's something that is a serious sort of item to pursue. It's something that's been overlooked.

We should have been at this long ago, the question of how good an estimator should be able to get. And I think it's a relatively answerable question, I think, if we got together and compared real results from estimators that are running, we could get an idea.

I bet we'd find, first of all, variability in the quality, because of the variability in the modeling underneath. And all we'd have to do is to take a look at which ones are running better, and we'd get an idea of what the yardstick ought to be.

MR. ALSAC: I think, again, maybe closer to the real time, to the operation, it is better to get more accurate, but as you move away from, and especially as you move into financial systems, it might be understood. I mean, we could decide to exaggerate it to the most we can say, toss the coin, and if everyone agrees that this is how we are going to dispatch, then it is a financial system which everyone agrees and there would be rules.

So as we go into the financial systems, although many engineers -- or as engineers, until we disagree, financial systems, we can use DC models.

All we need to do is to have market rules that do

cover when these approximate models do not provide some of the expected results. For instance, in a FTR, if using the C models we are selling excessive FTRs or underselling the system, there must be some rules to cover. But even if it is an AC, it is possible to sell more or less.

So we need these rules anyway, so the more financial, the more I think the question is it is better to initially start with simpler models and maybe in time, move into more accurate models.

MS. SILVERSTEIN: But at what point do I decide the model is not producing the right result, and, therefore, I need a rule as to distinguished from the model is not producing the right result, and, therefore, I need a better model?

MR. ALSAC: I think, again, it is -- even if you are using very accurate models, there is no guarantee that, for instance, you will not oversell, undersell FTRs. So, you need the rules anyway, independent of the model.

So in that sense, the question as you move into financial part of it, is not critical but as you go into more system operation, system dispatch, of course, the more accurate you get, the better, because you cannot operate the system at approximate models like DC where the lines are sort of overloaded in the real system.

MS. SILVERSTEIN: So it's better to make a mistake and have more imposition on the money than it is on the actual energy?

MR. ALSAC: It is not really as simple like I'm not implying that, but it is with the money like there is a system in which everyone agrees within an ISO. At least everyone knows the rules and everyone has time, once these rules are implemented, over a period of time, to analyze and maybe come back and refine the model. But we don't have his in the real time operation of power system. We cannot say, okay, we are going to burn a couple of transmission lines to find out if the accuracy is enough or not. But so we can define the financial models once we start approximate models and work our way into more complex.

For instance, in an AA, if we are trying to do AC modeling for FTRs, then the complexity increases an order of magnitude and together with it computation times. So it is even in some cases totally impractical to do certain things very accurately even if we desire that may not be initially

feasible.

MS. SILVERSTEIN: Mr. Irisarri:

MR. IRISARRI: As usual, there are always checks and balances in these systems. Coming back to the FTR location, is a process that you're going to be running say once a year and then you repeat it every month, but there is the associated revenue adequacy issue of the FTR location. If your system is consistently revenue inadequate, meaning that you are paying out more or receiving less than you have a hint that the auction wasn't on the previous month or the previous year is not, something is lacking.

' Now there are many sources. One could be modeling issues, AC versus DC, another simple one could be that you are selling or on there selling your rights because the limits that you have set in your transmission system may not be adequate themselves. And those limits are computed by a totally different entity based on previous experience with the ISO. For example, those limits may be computed by a planning entity which is different than the operations entity. The two at one point will have to come together and the revenue adequacies measure debt just like the objective function of the State Estimator is the check and balance as far as the accuracy of the results of the State Estimators themselves.

So at that point, as an engineer, you have to

decide where am I going wrong. Is it because I have the wrong model, is it because I have the wrong data that I'm providing to the model and precisely these are the issues that we have been discussing all morning long.

MR. FINNEY: You mentioned your agent in the field and those are the ones who are going to answer your question how do we stop, right? Because they beat up on us he vendors to assert exactly two things, and how we get there and what programs we use are not nearly as important as grid reliability, which we've been very good at for a long time, and transparency, which we are getting better at.

When their customers and the market monitoring unit can be assured that the prices that are posted are explicable, and repeatable, then we're done, right? When the markets stop complaining, the market participants are happy with the performance in the system, then odds are good that we're finished.

MS. SILVERSTEIN: You get points for the best answer in front of a Commissioner. Thank you.

MR. FINNEY: Great. Thanks.

MS. SILVERSTEIN: Commissioner Nora Brownell.

MR. RISTANOVIC: Well there are bigger issues in the ocean than data errors, that are producing large errors, so it has to be something built and designed to care of under selling or selling of FTRs.

MS. SILVERSTEIN: I'm going to declare victory for the morning. I've learned a lot. I hope some of you have. I hope many of you have as well. And I thank you all for being flexible this morning. It's been very helpful. We are lucky to have a number of exhibitors. The exhibits are downstairs on the first floor. There are stairways at each end of the building, there are elevators. We are on a break until 1:00 o'clock. There is a small restaurant, cafeteria over here, and there's also Union Station which has lots of restaurants but we'd rather you stay around and look at the exhibits and chat amongst yourselves. So thank you so much and we'll see you at 1:00 o'clock.

(Whereupon, the conference was recessed for lunch, to reconvene the same day, Thursday, July 18, 2002, at 1:00 p.m. in the same place.)

AFTERNOON SESSION

(1:05 p.m.)

MS. SILVERSTEIN: If I can ask those of you who have all your papers to sit down and those of you who don't have all your papers to be real quiet about getting them so we can get started please.

I am very pleased to be setting up this next panel which is on security issues and security not in the sense of does the grid work, but security is can we keep the grid up, and all of the operations and software and hardware that support it. And our two guests for this afternoon on security are Howard Schmidt, who is the Vice Chairman of the President's Critical Infrastructure Protection Board, and Chuck Noble of the New England ISO on behalf of the NERC Critical Infrastructure Protection Advisory Group.

We're going to start with Mr. Schmidt.

MR. SCHMIDT: Thank you very much, Alison. And thank you very much it's a privilege to be here today and on behalf of the President's Critical Infrastructure Protection Board and Dick Clark, we relish the opportunity to come and speak to you about this subject that's near and dear to our heart.

In about the ten minutes that I have, I want to sort of break this into three specific pieces. The first part I want to do is sort of set up, if you would, what

we've been seeing and what we've been thinking about relative to the broad term of cyber security.

The second piece I want to touch on is some of the Board priorities, some of the things that on behalf of the President that we're doing, setting up the priorities relative to cyber security.

And the last piece, and by far definitely not the least important is the President's National Strategy for Defending Cyberspace, particularly on the heels of the Department of Homeland Security strategy that just came out a couple days ago.

So with those remarks, I want to start out by talking about some of the things we've been seeing recently. We've seen a tremendous increase the past year or so, the number of hack attacks on our critical infrastructure, the Nile Service attacks, situations involving fraud, identity theft, theft of intellectual property, economic espionage that affects us greatly. But what we're also seeing, it no longer takes someone with great technical knowledge to be able to accomplish these tasks. We're seeing the tools becoming very much easier to use. I jokingly talked to my 86-year-old father that found a hacker tool and said this is kind of neat, what can I do with it. And in all honesty, he could have done something with it.

But also it takes what we're seeing as a

repackaging of, if you would, of these tools so you don't have a single thing that it's been shooting at, it shoots at mobile things at one time. So if it looks for vulnerability and it doesn't find it over here, it moves to the next one, to the next one to the next one to the next one, till if finally finds a way through the system.

We've seen that recently, by the way, last year in instances where we've seen the Code Red and the NIMDA attacks, which resulted in billions of dollars worth of damage. I think one of the other things we've seen we all agree, and once again thankful for the opportunity to be here today, as the owners and operators of the critical infrastructures are the ones that have the ability to make this more robust.

It's not a Department of Defense issue. They can't go out there and do a lot of the things they can do in a traditional sense, even though they do a great job in securing their systems, but it's going to take the collective efforts of all of us.

I mentioned the national strategy, and I'll go into detail in a moment, but the national strategy, and I want to make sure we're specific on this, it is indeed a national strategy, not a federal strategy, is to be successful, and once again we believe it will, it will take the coordinated efforts of our congressional leaders, the

government, Department of Defense, state and locals, and very importantly, most importantly, the private sector.

The thing that makes this strategy different is it will be a collection of input from all those sectors. It's not going to be something that a half a dozen bureaucrats get together in a room and say, here's our vision of the world to come, and what it's going to take to fix the cyber piece of it. We've had tremendous response from organizations such as this in providing input, meeting with us, sharing your mind share with us in this area, so we can create this living document.

And I think that's the other key point I want to bring up relative to this strategy is the living document itself is not something which is going to plug up on the shelf. It will be based, internet based, Web based, it'll be on CitiRom, we'll have the ability as technology changes, as vulnerabilities change, as input changes, we we've had more insights into the interdependencies that we can change as necessary.

And lastly, it's a situation where this is not something that just goes to the CIO or to CEO. We've seen a lot of instances now with the proliferation of home users having broad band and DSL and cable modems and we think, well what's that have to do with the power grid? What does this have to do with the chemical industry and the water

industry?

In reality, what we've seen is they become victims and in turn those victims are used to launch attacks on the rest of the infrastructure.

So it's kind of this set up message, if I could, on that. Now in conjunction with that, what we're looking at is some of the priorities that help deal with this. First and foremost, once again the awareness component, identifying the key components that we need to make sure that everyone's aware of. We've created what's known as the National Cyber Security Alliance using those same groups that I mentioned during the preceding comment, the private sector, the high tech industry, the trade associations, government agencies coming together. They actually have a Website called staysafeonline.info.info, which has a great deal of information for small businesses, consumers, small home office users to how they can do their part to secure things.

The next piece is the education. We have a program called "Cybers Corps for Scholarships for Service" with the ability to put people on the pipeline. We have about 450 people on the pipeline now, they're getting graduate and undergraduate training in information security, information assurance, with the intent of coming back and providing that same service to the government for a year or

two. If they leave and go to the private sector, we still win, because the private sector being the owners and operators can use the help as well.

Information sharing. The ability to take information specifically around things that are being seen at individual companies. We hear the vendors tell us about vulnerabilities and we've got I think a pretty good insight to that. But what are the actual companies saying? Many of the lawyers are concerned about issues around FOIA. If it shares information with the government, then it's an issue they have to be concerned about.

Research is a big component of this. Looking at the area beyond national security and market forces, where are the spaces where we need to do some research and development that's not something that one's going to buy or not something directly related to national security?

Physical security. We have a tendency to focus on the high tech piece and appropriately so, but there is also the physical security of those key components. The telecom hotels, points appearing that are affected by the IT side of it.

The other priority is standards and best practices. We've grown up. This is a relatively new technology. We've grown up in an environment where the normal engineering disciplines that we would see in the

electrical industry or the automotive or the space industry, we see those pieces lacking.

So looking about certification of IT professionals, looking at some baseline standards on what it means to be secure inside an environment. And in conjunction with that is digital control systems.

We have seen a pretty dramatic insight last year in Queensland, Australia where a digital control system was hacked from the Internet, causing the backflow of tens of thousands of gallons of raw, untreated sewage into the streets, hotel lobbies, and parks of one of the cities there.

Because increasing we're seeing these digital control devices being attached to the Internet either directly or indirectly through a backend administrative LAN that are now susceptible and vulnerable.

And lastly, the future systems that we deal with. As we start to implement the new technologies, we have to have the security as part of the core of business process. Many of us have looked at it, and myself included, in my private sector life as sort of a cost center type basis, but is indeed part of the business process. We have to build it into it, just like we have our HR departments, our financial departments and everything else.

Now taking the last couple of minutes here to focus on the strategy specifically, the strategy will have a couple of key components. First and foremost, we will outline a case for action, identifying our vulnerabilities and the potential threats.

But I want to touch on the threats piece for a second because we really need to focus more on the

vulnerability issue as opposed to trying to imagine what someone could throw against us. If we close the doors and lock the doors on the low-hanging fruit, the easy things to deal with, we can effectively reduce the ability for someone with malintent to affect our critical infrastructure.

The strategy is also a multi-level strategy. We're addressing the home users and small businesses. We're addressing the enterprise level folks. We're addressing each one of the critical infrastructures: Banking and finance, transportation, electrical, et cetera, looking at the federal agencies, looking at state and local governments that are very key, looking and very directly at the higher education, providing not only the folks in the pipeline to work in the field, but also the researchers and the Ph.D.s.

We're looking at the national structure issues, and of course as we saw with the President's strategy for homeland security, there's a component in there specifically addressing cyber security. It will address on a much broader scale in ours when it comes out in September.

And lastly, and definitely not least is the global is the global issues. For the government operations we have in various counties around the world to the operations that we in industry, by which our international corporations rely on that critical infrastructure of other companies, we have to address the issues of critical

infrastructure in our national strategy relative to that.

And my last comment on this segment is that at the end of each chapter of the strategy, we'll have some key pieces. We will have boxes to talk about, things that we need to have further discussion on. We'll have boxes that talks about some recommendations that we're seeing in our deliberations with the private sector and the other folks, and we'll also have boxes -- some of them will be empty now in the first cut of the strategy -- to reflect the specific programs that we have collectively decided that work best, that we need move on and put these programs into place.

So that's sort of the overview of what we're doing at the President's Critical Infrastructure Protection Board. And once again, thank you for the opportunity to meet with you this afternoon.

MS. SILVERSTEIN: It's a pleasure to have you here. Thank you very much. In February I think, Chairman Wood was visited by Dick Clark of the President's CIPB, and Mr. Clark sort of, if he were a hand-wringing kind of guy, he would have wrung his hands as he explained to us that out of all of the infrastructures in the U.S., the electricity was perhaps one of the most vulnerable and one of the most critical, and gee, since we were FERC, wasn't there something we could do about this? And we allowed as to how there might be, and it was called Standard Market Design,

and that might be a suitable vehicle for standards for cyber security.

And with that encouragement, I then took the liberty of forcing myself upon the North American -- say the whole thing for me, Chuck. NERC.

MR. NOBLE: North American Electric Reliability Council, NERC.

MS. SILVERSTEIN: Thank you. Those guys. And went to the Critical Infrastructure Protection Advisory Group, which is a group of voluntary association of folks from the ISOs, from the RTOs, from the utilities and from the stakeholder groups, and asked them if they would consider working with us to draft security standards for electricity infrastructure more cyber, and more physical to the degree that you need to protect physical, to protect cyber assets and systems.

And they debated a great deal and then did us the great favor of saying yes, and then did me the honor of letting me tag along for the ride. And after a very hectic couple of months, we now have for public review for the first time Chuck Noble, who is the head of the drafting group. And I'm pleased to note that there are several other members here.

Thank you. You know w ho you are, from the ISOs, who have been working on this also. Chuck is going to show

us what the draft standards are. These will be incorporated in the Standard Market Design NOPR and you all will get to comment on them to your heart's content before they are adopted. Chuck?

MR. NOBLE: Thank you. It's my honor to be here on behalf of the North American Electric Reliability Council and to discuss the proposals that we are making to FERC to be incorporated in the upcoming NOPR for SMD. And we're waiting to see if my presentation will be viewable or not.

MS. SILVERSTEIN: Lots of people have the handout, so just go with it and we'll see what happens.

MR. NOBLE: Okay. We'll move along. I will do more reading from the slide that I have in front of me.

(Slide.)

MR. NOBLE: As Alison has already said, FERC raised the issue several months ago, and in May, the North American Electric Reliability Council has a work group called the CIP Advisory Group, Critical Infrastructure Protection Advisory Group, reporting to the NERC Board of Trustees.

We picked up that task, and I am chairing the self-directed work team to develop the proposal. What was asked of us was to develop a set of minimum daily security standards that can be implemented across the environment to protect those critical assets involved in the market and

system operations, to the extent that they do integrate and affect the market as a whole.

The general scope of it was going to be primarily on the security standards, addressing as Alison has already said, physical standards to the extent that they are necessary to protect those cyber assets. And we wanted to identify measures to prevent an exploited vulnerability from causing cascading failures throughout the market and grid operations. This does indeed include interconnected SKATA and EMS.

(Slide.)

MR. NOBLE: But it also takes into consideration differences into not who you are how big you are, but what you do and how you do it, and address scalability along those lines.

This is to say, a small participant who maybe does not have a direct Internet presence, no routing access to the Internet, would not be required to implement part of these standards. It just would not apply to them. And this is sensitive for a lot of the smaller entities out there, and we want them to be sure that we are sensitive to those kinds of issues.

The proposal is based on standards derived from commonly accepted best practices throughout the industry, including such things as IP SEC, ST SEC, common criteria,

the ISO, a 799 standard, et cetera.

(Slide.)

MR. NOBLE: The initial set will be included in the NOPR coming up for SMD. As a follow-on to this, NERC is agreeing that they will establish an ongoing standards process. They will continue to enhance and maintain over time with changing technology and changing requirements a set of standards that will be in the future referred to by FERC by reference.

I think the point that I would like to make here is that FERC agrees that they don't have the security expertise to be doing this themselves, and they're looking to have NERC be the standards devolving body.

Just as a quick preview, the standards are going to address a few things.

(Slide.)

MR. NOBLE: The general purpose, which we've already outlined here the last few minutes. The applicability, which gives a definition of just who it is we're referring to as participants for the purpose of these standards, and how the standards will apply to their interaction with the market and system operations.

(Slide.)

MR. NOBLE: It also addresses the issue of compliance. As will be stated in the NOPR, it is intended

that these standards will become fully compliant and effective as of January 1, 2004. As part of that we will require, or FERC will require, a signed self-certification that the participant is completely certified and completely compliant with all of the standards or document reasons for noncompliance, either because it does not have to comply or they found some other solution which may be acceptable.

(Slide.)

MR. NOBLE: The standards cover a few basic things. They cover governance, scope, asset control, personnel access control, systems management planning, incident response and reporting, and business continuity. These are basic things that every company should be looking at.

Again, some of the smaller entities may not be as encumbered by the systems requirements for example, but we do expect all participants at a minimum to identify someone to be responsible for their security program, to have a documented program in place, to have at least a security policy and basic procedures in place, and to be doing the minimum things like anti-virus protection and authorize the access controls for their systems.

(Slide.)

MR. NOBLE: The current status as of January 17th, a final formal draft copy has gone to the full

Critical Infrastructure Protection Advisory Group for NERC for broad review and comment. All comments are due early next week, and our commitment is to have the final proposal submitted to FERC by July 24th. And at that time, we'll work with FERC to get the final verbiage into the NOPR for July 31st.

And that's about it at this point in time.

COMMISSIONER BROWNELL: Chuck, thanks. I have a couple of questions.

MR. NOBLE: Oh, you did get the slides up. I didn't realize.

COMMISSIONER BROWNELL: Could you just define a little more clearly what you mean by "smaller entities"?

MR. NOBLE: Well, I'll take an example from Massachusetts, a little town called Hudson, Massachusetts, a little municipality. They've got an office with two people that share that office. They share a Macintosh with modem and they dial up the AOL to submit a bid once a day or maybe once a month, okay.

I do not expect them to run out and buy a router and install firewall software and do intrusion detection systems and everything else to become compliant. That's someone who in terms of what they're doing and how they're doing it would not need to be compliant with that set of the standards.

Where would apply to them, though, and again I expect for all participants, they still need to identify somebody to be responsible for the security program, probably somebody from a management level, okay. I still expect them to have a security policy in place for their organization, and I would still expect them to do some minimal training and access control around who's authorized to access that Macintosh and to assure us that it's kept in a locked room when nobody's around, et cetera.

Those are really small cost issues and should not be an issue for them.

COMMISSIONER BROWNELL: But your proposal will take a shot at defining it in more than an anecdotal way?

MR. NOBLE: Yes.

COMMISSIONER BROWNELL: That there will be some measure so we're not debating that forever?

MR. NOBLE: Yes.

COMMISSIONER BROWNELL: Okay.

MR. NOBLE: With roughly 15 minutes, I did not prepare to come here to debate each individual proposal.

COMMISSIONER BROWNELL: No, no. I just want to get a handle on that. Self-certification, do you plan to have some kind of an audit, random audit? Would you expect us to do that?

MR. NOBLE: That is something I think we need to

work out.

COMMISSIONER BROWNELL: Okay. And governance? Governance of what? Governance of the organization in case of an emergency?

MR. NOBLE: Governance briefly is saying that they will anoint someone to be responsible at a management level for their security program to ensure they have a security policy, to ensure all these other things are compliant.

COMMISSIONER BROWNELL: Okay.

MR. NOBLE: Or they have documentation as to why not.

COMMISSIONER BROWNELL: Okay. Thanks.

MS. SILVERSTEIN: We have been walking a very fine line in designing and defining what these are supposed to do. We started by saying this is a minimum daily adult requirement. It is what using available practices and technologies anyone who has the capability to be used as a way to hurt the grid and operations needs to do to protect other people from their cyber assets, as well as to protect themselves.

But we tried to hard to look for what is the minimum that can be done that will achieve some meaningful level of protection and yet not create barriers to entry or significantly increased the costs of operation for smaller

participants in the market. So we are walking a fairly delicate balance there.

MR. SCHMIDT: Alison, if I may just add something. What I'm hearing here from Chuck saying is something we salute and we applaud the efforts to do this, and also to sort of frame it that this is totally consistent across every critical infrastructure we've seen: Issues around authentication and access control, issues around best practices, issues around even some fundamental policies depending upon the size of the organization, so we really support that this is a good way to look at the thing and it helps us in other industries as well.

MS. SILVERSTEIN: I'm really glad to hear that because we worked with your staff a lot to get to this point. Thank you.

MR. NOBLE: And if I could just add to that, I want to make sure everybody understands that this is just the first step for both FERC and for NERC, okay.

As I said, this will become an ongoing standards evolution process. I expect more detailed standards to come out of the NERC body itself over time, and we will continue to grow that as the technology changes, as requirements change, as new vulnerabilities are identified through the change of technology, et cetera.

So this is just the beginning for us.

COMMISSIONER BROWNELL: And in your working group, is there representation from the ISO community itself, or are you working with the companies?

MR. NOBLE: First, let me talk briefly about the Critical Infrastructure Protection Advisory Group in NERC, okay. It is made up of representatives from the initial four -- excuse me, ten reliability regions, okay. It has representation from most of the ISOs RTOs. It has representations from organizations such as EEI, NRECA, APPA, et cetera.

We have reached out to both the primary ISO and market organizations. We have reached out particularly through the EEI, to the asset owners, and they brought a lot to this table with regards to physical security, and also with the other industry associations who, by the way, do represent some of those very small entities and did have some concerns that we did try to accommodate.

MS. SILVERSTEIN: One of the things that as we go through the process of receiving public comment on the standards, do us a favor and focus less on the question of whether FERC should be setting standards and just bite that bullet and move on to are these the right standards.

But know that the electricity sector appears to be the first one for which standards for cyber in this day and age are being set. There are some for health care and

some for finance that were set in a different time for a different purpose, but this is the first post-9/11 set of cyber security standards to be undertaken, and it is our expectation that they will serve this approach, as well as these technology standards themselves will serve as a model for other industries and sectors. So we encourage you to help us get this right and to understand the purpose for which they are being done.

Copies are in the back of the room of the document itself, and we'll put it up on FERC's Web site this afternoon. This is a draft. Only folks who are in the NERC group are the only ones I think from whom we're taking comment at this time to change the draft, but everybody's welcome to comment on a notice of proposed regulation, and I don't expect that you all will be shy.

So let us know what you think and help us make this work for the sector. And please, as you go through serving this industry as software vendors, please build security integral to your software so that we don't have to spend extra money fixing it later to keep it from hurting the systems as a whole.

MR. NOBLE: Okay. And if anybody is interested, I have assurance from NERC that after today, sometime tomorrow morning, a copy of this presentation will be available from their Web site as well if anybody would like

a copy of the slides to work with their management.

COMMISSIONER BROWNELL: Thank you both for coming. I know you have busy day jobs. Howard, we appreciate the work you've done, and I think the inclusiveness that you have shown in terms of developing responses to very difficult and challenging issues. So, thank you for sharing the time with us today.

MR. SCHMIDT: Thank you.

MS. SILVERSTEIN: And my thanks to you both and my thanks especially to the NERC Critical Infrastructure Protection Group for working so hard on these draft standards and for putting up with me. I've enjoyed it greatly. Thank you.

COMMISSIONER BROWNELL: We thank you for putting up with her too.

(Laughter.)

MS. SILVERSTEIN: If you're on the next panel, come on down.

(Pause.)

MR. O'NEILL: Well, let's get started. This panel is composed of ISOs who have to implement the Standard Market Design and who have to use the vendor's software that we heard about this morning. And what we would like to hear from this panel today and to have a discussion on is their problems with implementing software. Obviously this is a

rather new venture here. The oldest ISO I think is what, six years old now? Or four or five years old.

So we have experiences. We're making progress. And we'd just like to hear from you about the problems you've had and how you see us solving them in the Standard Market Design, what FERC should do, what the ISO should do, and problems that you may see coming with the coming of larger RTOs or larger ISOs.

So let's I guess go right across the board and start with a nonregulated --

MS. SILVERSTEIN: They're regulated, just by someone else.

(Laughter.)

MR. O'NEILL: I didn't put the period in the sentence. Nonregulated by FERC, a nonregulated by FERC RTO, or ISO, sorry ERCOT.

MS. BROADRICK: Certainly with some experience with the Commission here. I'm Cherie Broadrick with ERCOT. I am relatively new to this position and filling in for Sam Jones today.

We did our software interface with an XML interface through a Web-based application, and we issued our XML standards to the market participants, and then they developed their interface with us through those standards.

Actually, I don't really have bad war stories.

I'm going to be very short here. We didn't have a whole lot of problems. I'm going to talk more on the people side of the business where we did see our problems, and that's in expectation setting and in education. And I heard a little bit about that this morning, and I don't think that we can minimize that aspect.

Education for the market participants and the staff of an ISO from the software vendors is integral. And I think our experience, and especially I ran the retail side of the business for two years, and my experience there is that if we don't publish our standards to one another and make visible how we calculate things, there's going to be a lot of hiccoughs.

So I would encourage definitely that whoever comes into the ISO to put software in place also has a big task in education and the staff and the market participants also. I believe visibility is integral to a seamless change in anything that we do in the way that we do business.

So that's pretty much what I have to say.

MR. O'NEILL: Dave?

MR. LA PLANTE: We're in the process of implementing our second market system. I don't want to dwell on the first one. I don't think it would be productive. But we are actually trying to do the first Standard Market Design implementation, if you will.

We decided to implement the PJM market design and the PJM software. So I think what we're learning here may be helpful as the Commission puts a Standard Market Design NOPR together.

The reasons we did it are I think some of the same reasons that are driving you to do it, which was to reduce the time to implement LMP in multi-settlement, reduce our schedule and development risks, and to reduce the costs.

To date, we've been fairly successful. It has met those objectives. The software has come in from the vendor on time. It's worked pretty well. So it has been positive. Of course, we don't really know how positive it is until we put the market live and see if we can actually run the market and the systems with it. But to date, the effort to standardize has shown the benefits we thought it would.

More specifically, some of the benefits were the market design process became much clearer. Back when New England implemented its first market in '96 and '97, coming together on what the market design was was awful. People were in a room. They couldn't get together on the design at all. Having made a commitment to a design up front streamlined that process and made it possible to move ahead.

And another benefit of an existing market design, especially one that works, is the market design is tried and

it's much more likely that it's going to work. So that certainly lessens the risk and I think is one of the reasons the Commission is trying to do a Standard Market Design.

And we've also been able to add some features to the original design to deal with some issues peculiar to New England, and we added losses to the PJM platform. So we've been able to build on it, and I think that's something that can be shared with other people that use the same software.

MR. O'NEILL: Dave, when you say losses, do you mean marginal losses?

MR. LA PLANTE: I do mean marginal losses. And they'll be part of the dispatch and part of the settlements, and we're going to allocate them in a fair way.

MS. SILVERSTEIN: As opposed to an unfair allocation?

(Laughter.)

MR. LA PLANTE: Well, I noticed that there was a case in front of the courts dealing with the allocation of loses, so we looked at that and tried to take that into account in our rules.

MR. O'NEILL: Doing it right isn't always easy.

MR. LA PLANTE: No. Some of the risks and issues we see from a Standard Market Design implementation on the market side is that there are operational issues that PJM doesn't face that we face. In particular, the way that we

use reserves on thermal units is different than the way PJM does. So some of the real time dispatch didn't have reserve constraints in it. We're going to try to run our system without that. That's something that we'll have to see how it works.

And there's also a change in operational practices that may be needed or terminology so that there is a conversion process as you standardize the transition affects the whole enterprise from the operators to the businesspeople to the market design people.

Now in terms of software implementation, some of the benefits were -- one of the big benefits for us and what influenced our decision is we had the same vendor as PJM did for some of their components, so that made it easier for us.

And a big benefit that may not pop out right away is if you're using existing software or a standard, you don't have to write a detailed functional requirements document, which is a very time consuming process for something as complicated as a market system. And the better the software documentation, the easier the implementation is going to be.

I'd like to mention one area that hasn't really been mentioned too much yet, which is settlement software. You have to operate these markets, and we focused and I think most of the thought on market software goes to the

algorithms that run the markets in the FTRs.

You also need to settle it. Settlement systems to date have been very implementation-specific, and that may continue for a while. I think it's possible to put a settlement engine together, and I think some vendors like LodeStar and others may have done that. But the settlement is integrated with the meter data, and the processes is that the transmission owners and the meter readers have for doing that.

So settlements is a bit messier. I think SMD may facilitate that because hopefully the data elements are the same and the market design is the same, so the settlement processes you get similar. But that's something that I think may come up in the NOPR and is something to think about as we move forward.

And related to settlements is publishing requirements and software, how you get the results of the market to the market. And if that's standardized, that's going to help everybody, because now all the market participants would have one set of data they're going after or one set of information. That's another area that's helpful.

In terms of maintaining standardization, this is going to be a huge challenge. As I said, we're adopting the PJM software, but even before we've gone live, we've had to

diverge from it, not in significant ways, but in ways that as they accumulate you'll have systems that are different over a period of years.

PJM's approach to market monitoring is very different than New England's. That flows back into the market and into the software design, so you end up with things that aren't quite the same.

Our observation from that is that some sort of body that agrees upon changes and differences is needed so a standard can in fact become a standard.

Is it so unimportant that no one cares if it's different or is that an important decision that people have to make? And that's I think another part of the Standard Market Design that's going to be an important decision and not an easy one, which is how much detail does the Standard Market Design have in it?

The more detail obviously the easier it is to keep the standard. On the other hand, who could manage -- can one entity manage all the detail that would be needed to effectively do it? And trying to balance how much detail can be effectively managed by one body with the need to have a standard market that's truly standard is going to be a difficult balancing act. But I think it's very important.

COMMISSIONER BROWNELL: Who should serve as such a standard-setting body? Or how do we go about creating

that?

MR. LA PLANTE: That's a good question. I think NAESB has been created to do certain things, but I think it's difficult for market participants to come together on issues that affect money. So those truly belong in the Commission's hands.

As the ISOs and RTOs, we've been sort of in the middle on a number of these issues and may be able to work in that role of coming up with reasonable proposals for solutions that affect money as sort of an intermediary between the business practices that NAESB maybe working with and the Commission's role of policy and rules.

So if there's a gap there, I think the ISOs and RTOs may be a good entity to use to fill that gap.

COMMISSIONER BROWNELL: Although in another context, Jim Torgerson from the Midwest ISO brought up the same issue of these nuanced differences and different timing issues that in fact undermine the very concept of Standard Market Design. And he called for some similar kind of higher body to take a look at this and make the rules around it.

So maybe it's a group of the ISOs. I'm just not sure. But I think we need to get there sooner rather than later, the more I hear, and I think we heard some things this morning that would suggest that as well.

MR. LA PLANTE: Right. And I think comments on the SMD NOPR will help us hopefully focus on that.

(Pause.)

I had a couple of comments that really were related to what happened, the discussion this morning, is the level of standardization should allow the vendors the ability to innovate. Otherwise, you're not going to get the number of vendors you need and the number of products that we need.

And in terms of software standards and creating RTOs, there was a lot of discussion today and actually quite a bit of discussion yesterday about the scale and the fact that the software is essential to have larger RTOs.

I think there was a whole set of operational issues associated with increasing the RTOs that have to be addressed as well. If we make large RTOs, it's going to require more complex sort of vertical structure to manage the grid. If you had one manager for the whole Eastern Interconnection, you'd have to have a whole number of sub-satellites that were doing a lot of the work to assure that the systems operated reliably.

So as we try to expand it in one direction horizontally, we're going to need to do a bunch of vertical integration and coordination for reliability. And I think the PJM MISO design relies on the existing utilities to do a

lot of that sort of detailed operation.

I had a number of other slides on standardization, but they're really repetitive with what went on this morning.

Thank you.

MR. OTT: Hi. I'm Andy Ott from PJM. I'm going to talk a little bit about some of our experiences as we've evolved over the years from a software point of view.

Some of our experiences really were based on the way PJM actually evolved. It was more a staged approach. We had a real time market starting in '98 out of the transmission rights market in '99 out of the day ahead market in 2000, et cetera. So as we were growing.

One thing we found was that as we grew the products if you will and the markets, as we searched for ways to acquire the software, one of the issues that we faced in just growth was we actually have multiple vendors for different parts of our market.

So actually getting the data, the technical model data in between was actually obviously not impossible, because we did it. But it took -- it added five months on to our schedule to actually do the conversion, because it was something that had to be automated so that we could convert the data from one to the other. So it wasn't an easy way to do it.

So I think that that kind of challenge has helped us to sort of point our focus for the future in really trying to look at how do we get data. And we're talking about the very technical data underneath that the software needs between two what I'll call different vendors.

And I think from our perspective, we solved the problem uniquely or once for that specific instance. But I think solving that problem globally is something we're looking for.

I think something related to that, if you think about challenges, if you think about our challenges, which are I guess important to me, but to my participants, what's really important is their challenges. In other words, when I rolled this stuff out, what was really their issues or their problems.

I think one of the issues that we have, PJM has tried to do a decent job in trying to keep pace with is really the issue of data transparency or transparency of information to the participants.

As we all know, these markets live on incentives, and these markets live on the consistency between what you're asking the market participant to do or the consistency between the dispatch and the pricing systems. And again, a lot of that is related to the confidence that people have in markets.

So when I need to put data out, data models out to the participants to allow them to verify or validate on their own, using their own people and vendors, et cetera, to run these models and try to make some sense out of them.

That's the whole, you know, the black box thing where, you know, is this thing really something you can't understand? And the answer is, well, if you're given the data, such that it's transparent, or a lot of dataflow is available to the participants, then it breaks down a lot of that while I'll call suspicion or whatever.

One of the challenges we've had is it's very difficult for us to put out the detailed data of the market or the power flow, because there's no standard data format. In other words, we have a standard for power flow. You have the PTI or whatever. But in these models, we actually use the more EMS-style model, the breaker type model. It is a very, very detailed level of model, which is not the same as the level of model that they use in transmission planning, for instance.

But in the actual market and system operations, you need a more detailed. There's really no good standard to transport data. And I think that's one of the first things we need to solidify. And I think we've talked about that kind of -- it's really a data format type standard that's needed. I don't think you need a standard in the

actual software modules, because that again would discourage invasion, but it's really how do you get the data between the two.

One of the other things we found with the participants is as we grew, you know, we were developing sort of as we went, how we're going to standardize our own Web interface or user interfaces for our participants. The newer ones we have would have XML. The old ones didn't have XML. They had some other format.

So as we look forward again to the future, we need to go back and make sure that those are standard. But beyond that, I think, as an industry, we suffer from a lack of the terminology. And again I call it an FTR, somebody else calls it a TCC. You know, for transmission, right, that's ridiculous. It just makes it a lot harder for the participants to keep up.

And again, it really costs them more money because they have to train themselves twice on using these systems. So really I see that as, if you're looking for sort of a place where the largest benefit is going to come, I think the largest benefit is going to come -- there are a few RTOs, ISOs. There are many more market participants. So if there's standardization we can do to make it easier for market participants to spend less money, I think that's really the area that you can reap the most benefit from a

cost point of view.

Because the RTOs' implementation cost we found is one thing. But every time I make a change, my 200 members may need to make that change 200 times to respond to mine. If they have to do that for every market they participate in, that could be much more expensive than you realize.

I'll stop there.

MS. SILVERSTEIN: Well, you know, the whole point of us doing a Standard Market Design NOPR is to get everybody to use the same words in a discussion.

MR. OTT: Formats.

MS. SILVERSTEIN: So we will all retrain each other simultaneously in a common terminology so that if we remain confused, it will be about the concepts rather than what the words mean.

MR. OTT: Very good. Data formats too.

MS. SILVERSTEIN: That's on the second day.

MS. BROADRICK: That will be shocking to Texans.

(Laughter.)

MS. SILVERSTEIN: Well, Texans don't have to do it that way, within ERCOT of course. But actually we just brought all the ERCOT terminology up with us and we're retraining the rest of the country to do it the Texas way.

COMMISSIONER BROWNELL: In your dreams, Alison.

(Laughter.)

MR. PALIZA: I'm Roberto Paliza with the Midwest ISO. And I'm going to talk about the MISO markets implementation effort. Our project in the Midwest is underway, and the target date for implementation of the markets is late 2003.

The initial effort is focused on combining and establishing the markets on the combined MISO, SPP footprint. And some statistics about this market, it will have 150 gigawatts peak load, 144,000 miles of transmission lines. More than 20 states will be involved, and these markets will include at least five transcos. ATC, Michigan, ITC, TransLink America.

This is the first step in establishment of what we have called the single market MISO-PJM-SPP. The schedule for implementation is 2005.

So it's a large scale market. Some of the main characteristics of this particular project is that we are starting from scratch in regard to energy markets, because the Midwest doesn't have a centralized market at this point in time. So there are no legacy systems that we have to deal with.

However, we have -- our base system that is basically the EMS that we use for real time and monitoring our security.

Another important characteristic of this project

is a multi-vendor project. We have a vendor for the day ahead market, the real time market, another vendor for the financial transmission rights, settlements and then another one for scheduling. So this will pose the challenge of interoperability among all these vendors and integration.

We are also looking beyond the initial implementation. We will have to deal with maintenance of the system and future enhancements since we are dealing with several vendors, several databases and several pieces of software.

The market model size is transmission-wise more than 30,000 buses, power flow buses; 3,000 to 4,000 generators. And it includes part of MAIN, MAPP, SPP and ERCA regions. These, as you can see, will pose a unique operational challenge when we talk about five minutes centralized dispatch.

In addition to that, a very important aspect in this project is to make sure that we build a system that we can coordinate with other RTOs such as PJM and those that are going to implement the Standard Market Design.

Now focusing on multi-vendor interoperability, we believe that the standards in this area are needed, that it will foster competition resulting in better products to build and upgrade a market system in a cost effective way.

And I would like to focus on a particular aspect

of this interoperability amongst vendors, and that is model exchange. When I talk about model exchange, I'm not talking only about a transmission system model. I'm talking about the market model. I'm talking about the dynamic data that is needed in order to support these models.

And we need to take into consideration offline type of data that needs to be exchanged as well as the real time data. So it adds another level of complexity.

We support the common information model, CIM, to be used as a standard for exchange these power system models and any enhancement that is needed in order to support these markets data exchange.

And in that regard, it is important that we identify the entity who will be responsible to administer this system. It could be a EPRI or IEEE in coordination with the users. It also is important to identify who is going to enforce these standards. NERC has done it in the past in certain aspects of the industry, but I think the customers, especially RTOs, need to be fully engaged in supporting the enforcement of these standards.

Other areas that standards could be very helpful are the common application programming and using interface, a standard data exchange, interchange to unload and download data such as XML.

Now when we talk about implementation of large

markets such as the Midwest, we have several aspects that we need to take into consideration. One of those is the operational challenge of managing such a market on a five-minute interval. There are numerous transmission constraints and contingencies that basically makes the operation very complex, numerous dispatch patterns and generation constraints.

In our case, we need to take into account a multi-control area structure, and the multiple NERC reliability regions that are included.

Now from the operational challenge, we also need to look at the system performance. And when I talk about system performance, I'm only talking about the application, the processing power, the number crunching, such as security constraint dispatch and security constraint commitment. But in addition to that, we need to take into consideration the data collection, distribution, storage and retrieval that could be significant in regards to performance.

Another aspect of implementing this large market is that it hasn't been done before. It is an immature marketplace. There is no experience in administering such a large market. And we know from the Northeast RTOs' experience that the overall process is not fully automated, and the operators play a key role in this operation.

Other aspects that are of importance for

implementing these large markets are testing of the software and hardware. There are numerous logical paths that need to be tested, including complex processes. Marketing monitoring is going to be a challenge. And as David mentioned before, market settlements. Processing and verification of invoicing and billing. This is also a very important aspect.

So in summary, we feel that they key aspects to ensure a successful implementation of large markets can be achieved by a well defined requirements process. As Andy mentioned before, implementing the project in stages, use of industry standards, having a well rounded project team with industry experience, establish a well defined and in-depth training programs, a high degree of system automation is required, and automater error checking and debugging is also required.

Thank you.

MS. SILVERSTEIN: Thank you. Mr. Watkins?

MR. WATKINS: I don't represent an ISO at this point, but actually I represent one working one and two wanabees at this point, so that's West Connect in the desert Southwest area, the California ISO, which we all know and love, and the RTO West, which is in the Northwest.

About a year and a half ago or so, there was a group that gathered called the Seams Steering Committee. It's now called the Seams Steering Committee of the Western Interconnection, SSCWI, and they thought, you know, we're building all this stuff, and we're all doing our own thing and it's become increasingly apparent that markets and commercial business are a big deal, and us working together.

And also we figured, you know, we're doing a lot of different things, and maybe we could work together on some things. And so they asked for us to investigate some things, and we formed a group called the Common Systems Interface Coordination Group, which we finally referred to as seasick (CSICG), and it's appropriate many times.

So what we've been doing is putting together -- it's an open group of members of the three potential RTOs, and also has a lot of vendors because, of course, we're talking about systems, and we're talking about efficiencies of systems and using backup control centers for each other, and a whole bunch of things like that, which eventually

involved a lot of systems and money and so on.

So it's actually had very high talent and very good input from multiple parties. So I come with that perspective today, and want to talk, actually, about something we've been calling electric grease. There's a handout -- this isn't what yours looks like, but it has two sides and the front, and it would really help if you could follow that, because there are some pictures I want to spend a few minutes with on that.

So, SMD, as we've talked about, is really about the what. It's got to slides on the front and it has a funny little circle that says seasick on the top left. I really do want you to be looking at it, so if you don't have it, it was in the handouts in the back.

MS. SILVERSTEIN: You do win the acronym award for the day.

MR. WATKINS: We also have a subgroup of that called BAD for the Business Architecture Development Group. I know you didn't want to know that. And the group -- never mind -- there's another group, but you don't want to hear about it.

Okay, so there's another group that once the BAD has done their thing, that we'll design requirements and protocols, which is RAPP, so we have a seasick, BAD, RAPP.

MS. SILVERSTEIN: We were hoping for the good,

the bad, and the ugly.

MR. WATKINS: Well, you know, we're working on that, and others have thought of all kinds of things.

So, we started talking -- SMD is about the what, right? It's about what the business stuff has to look like, how it has to function, what it has to do.

And that's great, but the problem is that it's the detail, right; it's the devil is in the details, and how do you make this happen?

And the thought was that there have actually been a number of efforts, a number of things that have been good efforts to look at single systems that would allow interactions or transactions to happen across the grid. And as OASIS came in '95 and '96, the idea was that we'd do this tagging thing, but we'd also have these transaction systems where everyone could talk and work it all the way through, and that somewhat got set aside, because of all the difficulties of trying to do our new, increasingly complex business, using our old tools, largely for scheduling and so on.

So, we've started thinking a lot about this, and so what I'm going to talk about is -- we call it electric grease, just because the idea is to grease the whole transaction process. And what we're going to talk about is a track to enable a comprehensive western wholesale electric

transaction system.

And I say western because that's our scope, but I think it's a higher need and a wider need. And so what SSCWI is about and the Western Area Connection is we're going to have our plan for the start to have three independent RTOs, but what we know is deeply important is to have a single market interface.

So to the outside user, it looks like a single RTO, so to speak, not a single RTO, but from the business point of view, it is a virtual RTO. So skip the second page here and move to the third, which has a diagram. It says Functional Model on the top.

And the first thing I'm going to tell you is that this isn't new, so when you look at it and say we thought of this, I know you thought of it. But the key is that there are a bunch of functions that we have that make the market operate, and there are other boxes you could put in here. You could break some of these out; you could put some other things in here, but basically it takes a transaction all the way through from this buy-and-sell, which is really about -- it's about bidding things in or any way you buy or sell energy -- long-term, short-term, however you do it, however you transact energy between buyers and sellers, it happens up in that box, which I know has real-time, day-ahead, and so on and long-term components.

And then there is the whole issue of transmission rights, whatever you call them, how do you get them, what are the third-party markets for them? There's a whole bunch of stuff wrapped in there.

Then there is the market systems, which is sometimes part of the rights, which is how do handle your congestion management? How do you make all this work?

And now here comes my issue, because a lot of this is commercial and it has to be commercial. The power systems are there to move energy, but real-time operations is kind of a mess right now. And it's not that we're not operating reliably, but the problem is that entities like the California ISO and Bonneville Power at this point, handle hundreds and hundreds and hundreds of transactions every hour, and if you have to go cut a whole bunch of stuff like this week we've had fires along the Pacific interties, California is short of energy, which is, of course, not new in the summer when you have a heat wave going through, and fires have been taking our lines down, the AC lines, so what happens in real-time, you have to cut a bunch of schedules. That's how you do your business.

Well, in real-time, you can't cut all the schedules. And what we end up with sometimes -- we do get them down often by just agreeing to move our controllers and then match the schedules later, because you can't go and say

I want to cut all these schedules, load; you've got to find another generator right now.

Generator, you've got to shut down, and you need to do it right now, within ten minutes. It's not possible; it doesn't happen the way the transaction systems are formed.

Tagging 1-7 gets us closer, but it still doesn't tap back to there, so we have a real-time operation, and that needs something. And you also have these other parts down below which are mostly after-the-fact, which is how you're handling all your metering, which is getting what your actuals are, compared to what you thought you were doing, settling all that between you.

And then why not transfer your funds electronically, too. There's a huge value of money as it sits, and it's often sitting it the wrong places, sometimes for months, because it takes a long time to settle all this stuff -- 40 days at best, you know, in some of our entities that I know of.

So the thought of this picture is -- and it's what we've been talking about all day today, but it's bigger and wider; is that we really need something that covers the transaction from the very inception of an energy deal, all the way through to the point where you move funds to pay people off, and all the pieces in between.

People have done this, by the way. There was a software vendor in '94 that actually did a proprietary system that covered most of this. It was before transmission and energy was separated, but these are not complete pipe dreams.

So the proposal of this model is -- and, again, this isn't new; it's what we've been talking about -- is that you need a common information interface, and when we refer to this, I don't think we're talking about standards that say you have to say this and you have to do this in your protocols; you have to use CIM; you have to do whatever. It's really saying that whatever you do, you have to have a model that will allow any of these boxes and maybe subsets of these boxes, to plug in.

So any vendor -- some of these are dominated by certain vendors. The idea is, any vendor, anybody that could conceive a way of doing it and someone would buy it, could go plug in their piece of this, and when they talked from their box, which could have whatever they wanted in it, because it's a black box, but it had to do a certain function, when it talked to these other systems, they would all understand what it was saying.

So this is our basic model, and so it's a functional model; it's not new. What's really important, I think, to put on there -- and I know it's obvious, but I'm

going to say it anyway -- is these little ovals on each side are really important.

One is, we have a whole bunch of legacy systems and components and there are a lot of non-jurisdictionals out there, right? And there are others that will play in a little different ways, like a certain state. And so what happens is that you really have to have hooks for your interfaces to these legacy systems. This is not minor. There's a lot of preexisting contracts and ways business has been done that has to be accommodated.

So we've put that and that has to attach to this bus, so we've got to find a way of doing that. And I'm going to talk about the way in a minute.

The other part is -- and this is really big for you guys; I know it is, and it's big for us, too. On the other side is a market monitor, because if you don't have transparency of data and all data looking the same and having the same hooks, it's really hard to know what's going on.

But if you do, and everything is defined and everything has been told what it means and where it goes, you've got transparency and you can see everything as a market monitor, and I think that's really important. The other part is, we have something out there called reliability coordinators, and you know they are really

important, because they watch over the larger part of the system. And suddenly they have a lot more data about schedules, and that's important.

The last thing I want to say on this is about that upper bar that sits there. And I think when we've talked, we've figured out that it might be bad to be super prescriptive about how every display should look, how every word should be said and all that.

But we do recognize that there is a problem that when people get to websites or they get to certain connections, they really want to see similar things. So the thought is, there probably should be some idea of standard interfaces, but don't go heavy on standard, like here's the picture, draw it like this, but find some way of making sure they are coordinated.

And so let me talk -- I'm not going to get to the good picture yet, but I'll talk about value for just a second. One is, we really do want a virtual, single, commercial interface, not a storefront that has three shops in it, where you go in and you have to find your way around the different pieces done. It needs to look like one thing.

The market needs to be efficient, and when we do this model we've just talked about, if we have common systems -- right now, people can do better things because they have better electronic systems to go query everybody's

OASIS. Some are really good at getting information out. Others aren't as good.

The ones who can somehow find it do better in the market. You need equal playing fields, level playing fields, and this does that.

The other part, though, is, we have a lot of transaction costs, so this a bad example. But Bonneville has like six real-time transmission schedulers sitting there, and that's way too many, right? But the problem is, they need it to handle all the transactions.

But when you have that many people working on the same thing, you've got problems. Sometimes you'll miss; sometimes two people think they're doing the same thing, and so on. And I don't think Bonneville does any worse than anyone else.

The main point is that we need some system that will tie all that together, make sure it's all happening electronically, so we're mainly just watching, instead of having huge human labor involved in doing this. Errors get introduced when you have human labor, so it's efficient, a more efficient market.

I already talked about monitoring for the market and reliability. But listen to this one, because this is pretty cool: We need something that will create high business agility.

Things are going to change. People are going to have new ideas. You know that we're talking about a five-minute market now, and with our current systems, we can't do that hardly, right? You can build specials that will do it in certain areas to do that, but it's difficult.

California is doing some of that stuff now because they need to. I mean, there's a need to do this. I've heard talk of continuous scheduling, right, which makes operators like me go crazy to think about continually setting ramp rates and mark schedules that run all kinds of hours.

But the fact is, if you created a good open systems model and made it work, you could do anything you could conceive of and it would be reliable. It would have to match acceptable business practices, which goes to SMD and FERC's function, but you could do anything, and you could even in this, create models that go still secure, cyber-wise, but you could do anything electronically.

There's lots of technologies out there that would allow you to do things. If you have the components and the open standards defined, you can do anything. Enough said.

Excellent access to information, I said that, and the other part that's really good about the plug-and-play is suddenly the vendors can play on a lot more equal footing, and you'll see more competition and the ability of vendors

to compete better with each other, which I think has high value.

So, I know you're tired of listening to me, but just two more slides. Go the picture that says Development Business Model. And it sounds like the words are wrong; but they're right.

So this is where it's a little different and I want to spend a second on this model, because the problem is that several good efforts have gone on -- and they were good efforts.

There is TMS and there have been other things where people have worked on ideas for transaction systems. One thing that was a problem was that the market design wasn't the same, so it was really, really hard to do this.

And a lot of them were IT solutions. What we really need is something that fits the market and goes in there. So, several vendors and people from ISOs and others have been sitting down and working through this, and so the model we've been proposing is really to say that there are standards groups and there are regulators groups and it's not a slam to put them at the bottom of the sheet; it just worked better for the thing.

But you notice they are not part of this -- yeah, okay -- it's not part of this box up top here. You need regulators. You've got to set the SMD stuff, and you really

need standards groups, NAESB is really important, and groups like ESC and OSC, you know, the Electronics Scheduling Cooperative and the OASIS -- whatever OSC stands for, OASIS Standards Group.

Those are really important, but our premise of this diagram is they're probably not the right people to develop systems, and develop the open access standards. They should be the ones making sure they fit, making sure they're effective, and making sure they're objective, you know, that they are fair and right. So you need a standards group that approves what's done.

The thought we had was what you really need to do is develop a consortium that's designed with intrinsic drivers for success, which means a number of things. One is that we'll have some source of revenue for paying for itself and things like that.

So the thought we thought -- and it's consistent with some things I heard this morning, was that the people that know the systems the best, and that know what's going on are watching the customers, and watching what FERC's doing, the standards and the regulations, are the vendors.

And there's a bunch of them out there, and there are a bunch of them that compete. So the thought of this model is, and that's why there's this oval that says Vendors, and they're sitting between those boxes, is each of

those vendors have proprietary applications, and they should.

And those are black boxes, to some degree, right? Given a function, they can do it any way they want. But there's also all the hooks into those boxes, right? There's a whole bunch of variables that come in and out of it, to do its function inside the box.

And the thought was, they are the best equipped, given some other members that would also be part of it, like people maybe from the ESC, some of the key ISO members, FERC person, maybe, but sitting in.

They would be the best ones to sit down and say given these boxes we know about and all the hooks we need to apply SMD, here's the standard, and sit down and put it down. And it's very difficult. This is a lot of stuff, and it's a lot of variables and a lot of things to get a handle on.

So the thought was, why don't we propose -- I'm applying it to the West right now -- why don't we propose something that's aimed at being successful at developing open systems and open standards.

Let's put the people that are most knowledgeable at it. I've heard Alstrom suggested, and maybe one of the models is to have them self-provide their labor into it, and there also probably would have to be some things you pay

for, like process management and some audit people, right, to kind of watch and project-manage what's going on, and have them develop and implement open standards and supporting systems.

And by supporting systems, on that other sheet, there was something that said a data mart and a validation thing. There is someplace where data has to know where it's talking, and you store data. You have storefronts so you can get the data you need to make the whole thing function.

And certainly have it highly, highly interfacing with the traders, the RTOs, ISOs, and the generators and the load-servers. And let them take the shot at it, and then it would be standards that would have to be approved by the appropriate standards groups.

That's the part that I think is a little different, and we don't frankly care what model is used. I'm almost done. But we think that something like that needs to be done that could be successful.

So I think I don't really need to talk about what FERC could do, except just to say support the flexibility to allow implementation of such things as that, support developing a comprehensive western interface like that, and support stakeholders. We really need to do that, because I think it will take FERC's support of something like this to say we believe this is the right track, go do it.

And finally, I think this is a significant step toward a single market vision and a big one. And however we do that.

(Fire alarm sounds.)

MR. WATKINS: I'm done.

MS. SILVERSTEIN: Let's pretend that it's a real, live fire alarm.

(Recess.)

MS. SILVERSTEIN: What we're going to do -- now don't make me do this to you again -- what we're going to do is continue with Mr. Thompson, and then we're going to go up and down the row asking questions of all of you, and overall unless anyone objects I think we'll just pretend that we took our 15 minute break. We're going to keep this panel going to 3:30 and then rather than do a 15-minute break then, if you need to get up and use the facilities, please do so, but let's just keep going and switch panelists or bring up the next batch because as I recall you all are just sitting tight in those chairs. What that'll do is in fact expedite the schedule a little bit. I know some of you need to run for airports and all so if we're lucky, this might let us wrap up 15 minutes earlier. Again, however, do not be shy. If you are a panelist and you're up here to be part of a conversation, and it's time for you to go catch a cab for the airport, wave goodbye and take off.

In anticipation of that, thank you all so much for coming today and for being part of this. I think we're all learning a lot on this side of the table and I hope that you all are as well.

Mr. Thompson?

MR. THOMPSON: Thank you, Alison. My name is Bob Thompson from the New York ISO market and systems design consultant, and was previously the project manager for

implementation of the existing ISO software systems. And I'm going to address several issues. I have a presentation, copies of which were available in the back. We'll be discussing lessons learned, what we now know about software implementation and ISO operations that we didn't know when we put this system into operation in November of '99. And the areas that I'm going to talk about briefly here are data requirements which have been discussed at some length. I'll talk about a couple of other aspects of that.

Testing, scheduling, and particularly scheduling software. Software itself, and last some seams issues and some perspective on seams resolution.

What we've seen as the -- we were pretty clear about what the data requirements and the posting and scheduling requirements were associated with running the markets normally. Before we began what we did not realize was the I think the degree to which sort of what Andy was referring to their PJM's focus on market participant data needs and the information that market participants need in order to understand what the market's doing and why things are happening the way they're happening.

And we have been in a fairly continuous mode of catch-up in that arena from the beginning. And the other major area that has been growing and continues to grow is the requirements of market monitoring, and specifically the

ability to get at the information that is the kind of information that market monitoring needs to do their job. And my sense is that with FERC now focusing, having their own market monitoring group, that that requirement is not going to be reduced, it's going to be growing. And both of those are significant considerations in software design.

Also one other item that Dave La Plante talked about billing systems. We also have a homegrown billing system in New York. It has been under constant change and modification as we've made market changes and we've corrected market problems. All of that stuff filters down to the billing software. It's continually being modified. And one of the other aspects of that is that the information, a lot of the information coming into the billing system really comes in through the next tier at New York which is the transmission owners and the existing metering system that the markets were sat down on top of. We've spent an enormous amount of time resolving data issues associated with billing, and the consequent rebilling and trueup processes that we've been involved in.

One of the things that we may want to look at in looking at standards is what is the reasonable amount of time to allow the market to establish final prices before they are fixed permanently and are not going to be revisited again because someone found some metering errors within the

system two years ago.

Moving on to testing. New York, as most of you probably know, we started into this business differently than did PJM and New England. We did the big bang approach where we went from nothing, from no markets to day ahead and real time and ancillary service markets, all in one stroke. And have been continuously in a process of change since that time. One of the investments that we've had to make that turns out to be more of an issue than we thought it was going to be is in an adequate bid to build quality assurance system where, as we make changes, and modifications to the way in which the system works, we can have confidence when we actually take those changes to the production system that we have sorted out any bugs or problems that may be present there or in the new function or the modified function as well as de facto we haven't broken anything else in the system.

We are not completely successful at that, but as you go forward, I think when you're not successful at that, you end up with billing issues, and you end up with a whole host of problems, and the presence within the systems and the software suite of an RTO or an ISO really must include a very adequate and well designed testing and QA facility, and it's not cheap. One of the aspects of that that has not been discussed here much is the area of simulation. The

simulators that most of us have available to begin with are simulators used for dispatcher training. And I think that some additional work needs to be done in looking at what should be done to the simulator facilities that may be part of your QA system that would give you the ability to adequately address the market conditions and the system conditions that the new software or even in the case of areas where you're looking at potential changes and you want to determine what the effect might be using a simulation facility to be able to identify that.

Now the next subject that I'll talk about briefly is scheduling and I think here I'm going to -- I want to add to the discussion this morning on the adequacy of the current technologies in the area of scheduling and network based applications, particularly unit commitment and unit commitment based functions like day-ahead market and in New York the real time dispatch.

I don't actually disagree with any of the numbers that were discussed this morning, but what is true is that there are issues other than simply scale. And they're really complexity. If you take John's comments on the testing that we've done on the expanded model for the Northeast RTO in New York, and he talked about a linear kind of three times expansion in terms of execution time. That's accurate. But what's not obvious is that if you then look

at the consequences of, say, a more sophisticated mitigation philosophy that requires you to go through that process more than once, go through it one time to determine whether or not you have a circumstance in which mitigation is required and having applied mitigation, do you now have to go through the process a second time in order to determine what is now the correct commitment or the correct commitment and dispatch.

And then you have a three times expansion due to scale and a two times expansion due to functionality, which gives you overall a sixth time. The mitigation is one arena in which we see additional functionality being added and demands made -- Yes?

MR. O'NEILL: Would you do a full model pass in the mitigation procedure?

MR. THOMPSON: Yes. Yes, we do.

MR. O'NEILL: And why do you think that's important?

MR. THOMPSON: It depends on whether we're talking here about the day-ahead commitment or real time. In the day-ahead unit commitment, we actually have, we actually go through the process a number of times, and for mitigation purposes, we only go through a portion of it. But in real time, away go through that very same portion once, and then we come, and if mitigation is called for, we

mitigate and then come back through it again, and while it's a shorter period of time, the execution time for the real time commitment and scheduling process is short compared to day-ahead, but you also have a very short time to do it in. We're talking now about 15-minute scheduling intervals and five-minute dispatches, and you must be able to accommodate those things that require you to go through your optimization software as many times as are necessary to handle the functional requirements. Mitigation is one. A second one in New York, and it may not be the same everywhere, but is our management of the gas turbines New York City. Can that process and establishing the correct signals for the pricing solution require us to also go through many portions of our real time dispatch software more than one time.

So my point here is that we are not just dealing with issues of scale but we're dealing with issues of increased functionality when we look at the performance of these applications. And that is you get into demand side response. We may have more, and I don't think we can rest comfortably with the fact that our particularly in the area of the commitment and the optimization software, that that technology which is based on some fairly old methodologies doesn't need to be looked at as a candidate for significant improvement in performance.

Relative to software, a little bit of just motherhood here, the software design in general. I think the componentized software design open architecture, standard interfaces we've talked about. One of the other elements though is the incorporation in the basic infrastructure of technologies such as the Enterprise architecture integration methodologies, which are going to significantly I think improve the ability to make changes in a more timely manner, to improve the performance in testing of software which tends to be one of the real time-consuming efforts.

Our time is spent in design and in testing. The implementation of changes is relatively straightforward and does not take a great deal of time. Coding is not a long time-consuming process. It's really making sure that before you ever start coding, you've actually gone through and looked at all of the aspects of your operation that are affected by some potential change, and that you know everything that you're going to have to do.

And then in the end when you've got the software back, and it's been through modular testing, is the system level testing and developing confidence that this thing works in a whole variety of circumstances before you stick it into the system. And I think the EAIR architectures are going to be very helpful in that process also, and being

able to integrate test facilities in with your overall system architecture. And the presentation actually has a diagram of one of those architectures in it, so you can just for reference here.

Lastly, I'd like to talk briefly about seams. I think I would agree with the general thrust of things here which seems to be that focusing on the market participants issues and problems associated with scheduling and interfacing with various ISOs for the scheduling of their transaction and their energy is a good way to approach it. To look at it from the user's point of view and that the efforts in the Southwest as well as in the Northeast here towards developing some standard or some one-stop-shop interfaces for the various ISOs and RTOs that exist in the region can be a mechanism to force that to happen.

I also think that if FERC focuses a great deal of attention on that and holds people's feet to the fire in terms of timing and getting that accomplished, it would be very helpful because it helps establish the priorities in which software development is scheduled at these various locations when that's present, that kind of emphasis.

MS. SILVERSTEIN: By locations, do you mean in the vendor's house or in yours?

MR. THOMPSON: No, I'm talking about in the ISO's house. People who are writing the checks for this stuff.

And then also I think related to seams, I'd like to talk about one other issue and that is that it's that software rules, changes, standardization of rules, and software alone, are probably not going to be an adequate solution for seams issues. There's a lot of what's involved in solving seams issues that has simply to do with the control areas communicating with one another and cooperating with one another. And that's where I think that the influence of the regulators can have some real impact is to help get both the management as well as the technical teams in the multiple control areas focused on actually solving the problem. When they do that they can solve them pretty quickly.

When they are guarding other projects and working off of other priority lists it can be easy to postpone and move out efforts that would facilitate this kind of process change because it involves changing on the operations floor, it involves some changes in the IT organization, software plans, etc., and the kind of emphasis that FERC can bring to bear in this area saying you must get this done can help make that happen.

But I think that a lot of what needs to go on is a matter of communication and cooperation and not so much of a lot of software changes. Just as a sidelight, the idea that having the same software will somehow eliminate a seam

was kind of just proven last week or so between the IMO and New York who have nearly identical real time scheduling software. And yet it was our process, an incomplete process that we'd been working out with them, that was the source of failure and created some scheduling anomalies where we were not in fact scheduling transactions that we should have been, and it had nothing to do with dissimilarity in software. We schedule with entities that have dissimilar software and even objectives on a regular basis and with processes and procedures that work. There is not a necessity to make all of the software in an area identical in order to solve these kinds of seams issues.

So just in summary, I think that as far as software and system infrastructure, I think we've got to focus more attention on incorporating modern tools and technologies and particularly I think that in the area of scheduling software, that's going to become more critical to us, and as far as seams resolution, I think SMD is going to help and FERC's focus is going to help. But that we need to really begin working much more cooperatively together to get these solutions implemented.

MS. SILVERSTEIN: Let me follow up by asking you first and then inviting everyone else to jump in, the following question. And it goes to your point about the safe software won't make the seam go away. That my

impression of what you said was that it's more about human communications and scheduling issues and practices that get in the way rather than the software. Let me follow that up by asking then if we're always going to have problems with those pesky humans and their communications and practices issues, will having the same software make it easier to work around the humans.

MR. THOMPSON: Well, I don't think it's just the presence of humans. It has much more to do with the business processes. If you look at two control areas, whoever they are, control areas A and B, with identical software, but each of them solving their own internal network and business problems, and there's a set of ten or 12 transactions that are candidates to go between those two control areas. And if they go about their scheduling process independent of one another, and then come together as they do today, 30 minutes before the hour, and control area A tells control area B well, I've got the following transactions scheduled. And control area B looks at his list and includes a few of those but not all of them.

And what they settle on are those that they have in common. It can be a process that's as simple as the protocol that we developed with the IMO is that actually the IMO closes their hourly market ahead of us and looking at the set of transactions that are candidates to go between

control areas, we do not include in our evaluation any transactions that have not been scheduled at the IMO because they're going to get cut anyway. They're going to get cut in the checkout process. They're not going to flow simply because we schedule them. They have to be scheduled at both ends.

MS. SILVERSTEIN: Just to be clear, one of the things that we want to do in SMD is we will eliminate a lot of those disparate scheduling processes for instance. We will not do it in the rule but we will say you will use, for instance, the same point of time on the clock to define your starting hour, or you will do your scheduling and you will all close it at the following minute, or you will all do ten-minute or 15-minute, although the details of that are likely to be worked out at NASB, once we make the policy call.

But my underlying question to you is notwithstanding the fact that we can't standardize humans, nonetheless will having common software make it easier to deal with the non-standard human problem.

MR. THOMPSON: I actually don't know that it will. I don't know that it will. It could. I think for instance closing at the same time is probably may not be the best idea. A cascaded close is far easier for people. I know that people in New York, because away post our

schedules, our day-ahead schedules at 11:00 o'clock, go to New York, determine what's been scheduled in New York, and then make adjustments in neighboring control areas, and I think that that's a useful thing.

MR. LA PLANTE: In terms of the seams for transactions, there's sort of three causes. One is software limitations. I know New York runs BME and it takes them 75 minutes to get the data in and run the BME and make a decision about it, so that's a software limitation. It may be able to be fixed. So everyone having the same software that was efficient could fix that.

There's also business process and checkout things which I think you were just discussing where you just need to streamline that and people can get efficient about doing it at the same time and in the same way.

That is something that could be worked on and improved. I think SMD may help do that, but I think people working together can help do it, too, and I think we have done a good job of that over the past couple of years.

Since New York's market has gone into effect and since we've all put markets in, we have all improved our process as a checkout, and I think it has improved things. So those areas can be improved.

I think the final area where the seams are going to continue to exist until we have central dispatch is that the price to sell out of one area is going to be different than the price to sell in from the other area.

You really can't do anything about that if you have two control areas and two markets, as the price is based on what's going on in the individual market.

So that is sort of the limit that we can go to. We can't solve that problem without changing the market definition.

MS. SILVERSTEIN: Andy, did you want to talk about this?

MR. OTT: No.

MR. PALIZA: I think having standard processes in place will help in managing the seams, but there are some issues, some seam issues, that go beyond the standard processes in these markets. I will just put one on the

table.

How do you honor external flow gate?

How do you compensate for loop flows caused by external systems?

So we shouldn't do the prospective of, you know, some big issues that impacts some regions in different ways. This is just as important for Control Area A, but maybe not that important for Control Area B. It depends on the configuration of the system and how much they are intertwined with each other.

MS. SILVERSTEIN: You are absolutely correct. And of course one of our goals in Standard Market Design is to handle the easy seams issues so you guys have more energy to deal with the hard ones.

MR. PALIZA: Thank you.

MR. LA PLANTE: We're getting bored.

(Laughter.)

MS. SILVERSTEIN: We could have another fire drill, if that would help.

(Laughter.)

MS. SILVERSTEIN: Let's go back to a topic that was mentioned right at the beginning, and that is education and the importance of having market participants understanding what it is you are doing to them and what it is they have to do back, and why, and how.

I wonder, Cherie, since ERCOT did this pretty thoroughly and it wasn't enough, can you talk about what you did and what you would do differently, and what others need to do?

MS. BROADRICK: Yes, I would love to talk about that because it is near and dear to my heart.

In ERCOT we did what we called a series of market readiness series meetings. We did those every other month. We came out with presentations and invited all market participants. But what it failed to do was failed to be as interactive as I think we are going to have to become as we continue to change and work with our market participants.

I noted a few things down here, so I am going to kind of read from them so that I don't miss anything.

I think to adequately prepare market participants, you must first require your vendors to engage in the training of both your staff and the market participant's staff.

So I would expand that role, if I were to do this again, and I would put a lot more pot of dollars towards market participant training and expectations from the vendors.

Our vendors did a train-the-trainer approach, and this was not sufficient. Training material was developed too soon. So when we started up, it wasn't relevant. So

that 's another thing.

Look at where they're going to develop the training material. Make sure that it is done on the back side, or in increments to where it is relevant.

I would require vendors to publish technical specifications often, often, often, and stand ready to answer questions.

I would also encourage the development of a technical implementation group very early in the process. This is made up of vendor staff, ISO staff, and market participant staff. Let them Storm Norm all the things that groups do before they get to the weighty issues.

Let them become a cohesive group. Then, as you are marching through implementation, they know how to work together. One of the problems that we had is that we weren't visible enough with our technical specifications to the market participants.

Our CEO makes a statement that I love to hear him talk about. He said: It's not the problems of where we met up at the flange; we did really well at that. It's the problems behind the flange.

You thought I meant this.

I thought you meant that.

And we're certainly not talking.

The flange is okay, but we're doing something

logically behind that flange that's not making sense.

This technical group--and I can't stress this one enough--is hard to do. It's great to say, and it's very difficult to do because of distrust issues. But you've got to get this group together and make it a technical implementation group. Get the right folks to the table. This is not one where it is high-level business folks. It's the implementation people.

This group should then morph into your testing group, and an ongoing Q&A group for your market. I would put a lot of respect into this type of group. And we're still working with this in our pot. we're still trying to develop that. We've not even gotten there with this piece of it.

I would bring this up to the forefront of your implementation of Standard Market Design and let it flow through the whole process.

MS. SILVERSTEIN: Anything on training from other ISOs?

MR. WATKINS: We've been looking at that in the West. One of our ideas really between RTOs is to do joint training. We want scheduling coordinators to have a similar interface.

So the idea is: Why train them all separately? Do something jointly and develop programs simulators and so

on to do that, as we're building it and as it is appropriate, as she mentioned.

MR. THOMPSON: One other comment. It is not specifically training people; it's more a matter of allowing market participants to get their systems prepared.

These guys all have systems out there as well, and they're faced with ours, and getting a thorough, full understanding of exactly what the electronic interfaces look like, how they work, good protocol definitions, et cetera, is immensely helpful, as well as an opportunity to test them out.

MR. LA PLANTE: One small note. There can be too much emphasis on interfaces, on the actual interfaces, because most of the data that gets submitted is submitted by file uploads by large companies.

So while there may be some interfaces that are used heavily maybe operator-to-operator, a lot of the commercial work is really done using file uploads.

So in terms of designing and thinking about things, you don't want to spend--interfaces can be expensive. So if you put all your emphasis there, you could end up spending lots of money on interfaces that really aren't used.

That's just something to think about as we move forward.

MS. SILVERSTEIN: Changing the topic slightly, FERC has, in the year I've been here, a fair amount of experience at saying: ISO go change your system to do this. And getting a little bit of push-back from ya'll about the feasibility of making software do the thing that we needed to do--and I heard a little bit of that in your discussion. Jamie Sample, talk to him about how to make AMP work, please.

And beyond that, more broadly I've heard you all essentially telling the vendors what you need them to be doing and thinking differently. For instance, updating the technology and algorithms inside the State Estimator box and the Unit Commitment box.

To what degree is there--and, vendors, I'm going to ask them first, and then ya'll will be back up at the table and you can have a rebuttal opportunity--to what degree do you have these discussions directly with vendors about here's what it is we need, and here's how it needs to change, and here is how important it is or isn't to us, and what the deadline needs to be.

MR. THOMPSON: We work pretty closely with vendors on software development. We generally bring them in early, and I'm thinking now about our continuing effort at changes and modifications, as opposed to an arm's length where we write a specification and throw it over the fence.

It's not that kind of an arrangement at all. We work quite closely with the vendor almost as a team to implement these changes.

Many of them are new, and the risks of getting them wrong are high. And so we share those risks.

MR. LA PLANTE: It's not so much getting them in; it's the time it takes to do it. We work well internally. We've been working on these markets for three years. We've gotten relationships with the vendors. We've improved our internal processes quite a bit.

We've improved the way we work with the market participants to do these things. But I think Bob made an excellent point earlier. The time comes not in the coding of it but really in the design and the testing of it.

They are complex systems, so when we get a request to do something in a short period of time, it just may not be consistent with good software development practice to get it done within that time.

So it's just a lot of work.

MR. OTT: I think one area is obviously a cooperative relationship with vendors. You have to do it if you're going to keep the pace of this. I mean the changes we're making to large systems are as fast as we are.

But I think the other thing you have to work with with your vendor is the training issue. We actually train

the vendors, because they have to understand your market and what the implications are. Because when their people are doing the work, the more they know about the way you use the stuff the better.

We actually invite vendors to sit on our floors to actually see how the stuff is used to make it better. I think that is probably part of the cooperative relationship you're talking about.

I think that kind of interaction has to happen and does happen.

I think the biggest issue with, as you're talking about the pace of change, if you will, is really managing change, how should I say, and still making it audible and still making quality happen.

Essentially you can't just throw a change in and close your eyes and hope. So I mean that's really been the biggest issue.

MS. SILVERSTEIN: You have been the setup man for my last question for this panel. Which is, the change management process.

We learned in Texas when we were doing telecom competition and creating a wholesale telecom competition and retail competition there, that he who controlled the legacy systems wins. And, that you could use back-office systems essentially as a barrier to entry or as a way to delay

competition if you were an incumbent, and the only way we could make systems change over time to evolve into something that could support a competitive market was that we needed a rigorous change in the management process that had participation by the customers as well as the vendors, and so on and so forth.

Everything was rigorously documented and explained and rolled out and justified and managed, and so on and so forth, so that everybody got there at the same time. But in telecom, that was, I'm going to say, relatively easy. I know you are all going to roll your eyes. In comparison to this, largely because there is one incumbent and we know the software for that stuff works, and there were not so many competitors that you couldn't fit them all in a room and roll it out in a coordinated fashion if you could get them to agree technically what needed to be done.

Yet here, we are looking at a significantly more complex set of software with a significantly more complex set of users and needs.

So have ya'll given any thought to going forward under something like Standard Market Design? How do we make a change management process work so that it doesn't create more chaos than it causes and we don't get stuck with electric market software that looks like what the FAA is

using to land airplanes?

MR. WATKINS: I've got one thought on that. And again we haven't built anything, but we've had a lot of discussions with California, and we have had an open forum. We had the vendors present, and others, and a lot of those vendors have been involved with you guys.

And the thought was, and especially Washington and California, is if you push too fast, you end up with poor change management. You don't get what you want.

They often had systems that got built before the requirements had been sealed, where people didn't understand the pieces. So there is somehow this fine line between pushing hard for diligent action and going so fast that you miss.

MS. SILVERSTEIN: So you're talking case management?

MR. WATKINS: Well, and I'm assuming when you say--we have change management that says if you change software you have to write it down, and all that, and I assume what you're talking about is managing the culture so people change, so you bring implementation of change? Right? Is that what you're talking about?

MS. SILVERSTEIN: (Nods in the affirmative.)

MR. WATKINS: Yes. And so one of the problems is, if you--I am going to be bold here--if you come out and

say you have to do this, and we want it in a year, and you didn't do this, California, but their state law did, it had to be done very quickly, what you will do is not be able to manage all the pieces you need to in getting people ready and moving people up to speed.

MR. OTT: I think as you are managing these things, again, you can intelligently manage change. In other words, if for instance in a market we're rolling out, obviously we understand the important changes we need to get out there to sort of get notice out, or lock down very quickly, is the User Interface Change.

In other words, you've got to tell the users eight months ahead of time, or whatever it is. In other words, our spinning reserves market going in in the fall, the protocols and data transfers were designed and sent to them so they know what to expect.

You know, that was locked down early. Where there are other things you can, in the change management process, you can allow the change as you move forward and learn more as you actually implement.

So I think there are ways. I mean this isn't like--it sounded a little gloomy, so I figured I would throw in something positive. I mean it isn't necessarily an impossible task to intelligently manage change.

I think the issue of change management is you

need a plan. You need a way to do it. You need coordination to do it.

I think when I say "you" I mean the RTO and its participants, or its stakeholders, if you will.

Obviously the RTOs are each other's stakeholders to some extent because we share data with each other. But to be honest, the vast majority of the impact is on our own, the people who are participating in the market and of course our own employees.

But I think you can do it in such a way that you lock down the necessary things early such that the affected parties have a chance to manage their own change, if you will. So it's not necessarily an impossible task.

MR. LA PLANTE: Were you speaking of the change of rolling out a market in an area that wouldn't have a market? Is that sort of change management?

MS. SILVERSTEIN: That's part of it too, but I was thinking more specifically about -- that's big changes. I was thinking about procedural changes like we're going to migrate from version five to version six or we're going to throw in this new set of bells and whistles that change the way we do the following thing, which is the kind of change that you all do more frequently I assume.

MR. LA PLANTE: Right. We have gotten better at that I think as we've done more and more of them. We've heard from our participants what we haven't done well, and they've helped us do it better.

MR. OTT: And I think that's kind of our message too. Our market participants trained us fairly early, and

we've evolved a process in which market participants are very involved at the front end actually in helping define requirements and design functionally how these things are all going to work.

And we've developed a process of fairly close communication through the committees of presentations well in advance in a series of them coming up, so that particularly for anything major, there is a coordination with the training program as well as a lot of presentations so that people who would possibly not be getting the word, people who are going to do the billing processing and the folks that catch the tail end of these things are well aware ahead of time and people have an opportunity to adjust.

MS. SILVERSTEIN: At this point we're going go bring back up the folks from the vendors and Clark Kellings of EPRI and while you all are coming up, Marv and Phil, do you all want to move down a little closer so we've got room for them at that end? And I want to offer you an opening question to think about while people are moving around. Don't have to wear jackets for this. It's summertime in Washington, so lose the jackets.

The opening question that I offer you is, we were talking about the necessity of specs and about managing expectations for each other and educating market participants, and so my opening question for you all to

think about is, does a draft Standard Market Design proposal with warning that the final is coming out in December and opportunities to comment and shape what those look like in technical workshops along the way constitute appropriate notice and expectation management for the process of developing expectations about what the next generation of software needs to do and look like?

(Pause.)

MR. WATKINS: Could you repeat that? We were all watching each other.

(Laughter.)

MR. WATKINS: Sorry, Alison. It was a very good question I'm sure.

(Pause.)

MS. SILVERSTEIN: Okay. Is this everybody? I think the question that I just asked was, we were talking about the importance of everybody understanding what's coming and what the requirements are and what you need the software to do and working with your vendors to say this is what it needs to do and working with your customers to make sure they understand what's coming at them. And my question for you is, does a NOPR issued in July with the opportunity to comment and the opportunity to participate in technical workshops to shape pieces of that and make sure everybody has a common understand of what's in it, and then a final

rule developed based on those comments and that proposal in December, how does that do in terms of educating you and your vendors and your users as to what's coming down the pike?

The format for this portion of our program is, if you've got something to say, wave or raise your hand or leap for the mike.

MR. OTT: I think the format works fine if when the ruling comes out there is appropriate length of time to comply, if you will. I think having the forum to put out a NOPR, have I guess meetings and comments to further understanding, et cetera, and then having a final ruling, as long as the filing ruling then gives some additional time for all of us to comply if you will, that's probably fine.

MR. PALIZA: In addition to that, I would say that a key aspect of the success in implementing the Standard Market Design is in how much detail you are going to include in that NOPR. Are we expecting, I mean, all the way down to the market rules? Are we expecting a high level type of NOPR? That's a key aspect of it, because whatever is left, you know, is something that the vendors and the RTOs will need to complete. How much work is left for us to do?

And then as Andy mentioned, it is important a timeline. Is this something that we have to be doing in

stages? Is there flexibility in the implementation process?

MR. O'NEILL: I would expect that part of your comments in response to the NOPR will address issues that you wish to educate us on, like what you think the appropriate pace and sequence and timing of the implementation of SMD should be.

You need to help us understand what it's going to take to make this work and what needs to be rolled out first, and I also expect that your comments will tell us whether we've hit a level of detail that you can start writing software to or whether we need to go higher or deeper in order to give you something that gets us models that do the same thing every time in every part of the country, which is our goal.

Anyone else?

MS. BROADRICK: I was going to mention, it doesn't seem to me that we look at phasing things as often as we should. And that's something that I think is a very appropriate way to make these large-scale changes in a market is phasing them.

What that buys you is an ability after that you hit that phase target to look around and say okay, let's give ourselves another month and see how are we doing with what we just implemented.

So it gives you the ability to take a pulse and

say, do we now go forward to phase two, instead of just a big bang theory that most of us have experienced.

And the problem with the big bang theory is sometimes there's so many things wrong you can't even find which ones are really causing a problem. You're treating too many symptoms.

So I would encourage the markets as we continue to grow to start looking at phasing things and digest them when we get to those phases. Let's really see so we can identify what the problem is and not just treat the symptoms.

MR. BRITTON: One comment I'd like to make is Standard Market Design does not necessarily imply standard software design, and I think those two things a lot of times get mushed together.

What will be interesting is in the NOPR the extent to which it dictates elements of standard software design, and I would hope that there are bits of it that are doable and most of it is left to us to implement. That will be the most effective way to do it. But that's just a big open issue that we don't have visibility into yet.

MR. GELLINGS: Alison? I agree with Jay's point, but there is a piece that was covered rather well this morning that may be worth circling back to for just a moment, and that is the question about market data

interfaces. Not the modeling, not the how the computation is done, but what the data set looks like.

And I think an important part of Standard Market Design ought to be suggesting that that be standardized, essentially standardizing the ability to then communicate data. I think the point was made strongly this morning by others that that reduces costs and actually promotes competition and encourages innovation as long as of course you stay away from the model design issue.

Of course, you do break down some proprietary barriers. We heard a couple of very large vendors indicate that that's actually a good thing. And what we're proposing to do is to extend -- and the suggestion has been made by several others -- the EPRI common information model to the market side. It's already quite well used on the operations side. NERC now requires regional security coordinators to exchange system modeling information using CIM-compliant databases.

We're currently applying it on the planning side, developing applications there, and announced, as you may know that on September 12th we're going to hold a workshop specifically about CIM extensions and provide an open forum to discuss how that might be done.

MR. IRISARRI: I was just going to mention that my expectation of the NOPR is that it will be perhaps an

unambiguous requirements definition document that we can interpret more or less in the same terms, all the vendors, so that we can develop our applications to meet those requirements rather than going ahead and start implementing something that then later we are told sorry, but this is not what we as an RTO understood that process to be or that process to mean.

So that requires some level of detail and some tightening of definitions and concepts so that it can be interpreted in a clear manner by all the interested parties.

MS. SILVERSTEIN: I think that is our goal as well. The question is whether we can deliver that to you. But we're working pretty hard at it.

MR. BRITTON: I have one comment to what Clark just said on the common information model. And I think he's raised an issue that actually is a good illustration of the point I stated earlier more generally.

I want say two things. One is I think the Common Information Model is a very good thing as engineering effort, and it's an excellent idea to extend it into markets. I think it would be a terrible idea to specify it in a NOPR.

And the reason is that there's too much left to do, and that's precisely the kind of thing that would delay the process quite a bit.

So I'll leave it at that. I won't try to go into more detail as to why.

MR. O'NEILL: I guess one of the questions and one of the issues that I hadn't fully understood or fully taken into account was the impact on participants.

Each market participant probably operates in each one of the ISO or RTO markets and has its own processing software. So there's a lot of additional benefit to standardizing the data. And I was wondering, I mean, Clark has obviously put down a modeling proposal or a data proposal, and Jay is not terribly excited about it. And we've introduced new terms here. We have standards, guidelines and open data.

And could we just get an idea of whether or not -- by the way, I don't think the NOPR will standardize the data. The question is whether the NOPR asks the industry to standardize the data. And by "the data", I mean the input and the output of these models.

And also, after talking to some people, I don't mean the processing to get it into a data structure that's efficient for processing the algorithm. I mean something that's reasonably standard in terms of, for example, Andy being able to interchange data with Dave or Roberto and not have to reconvert the data and not have to send his engineers into the database to figure out what happens.

Could you guys talk to that? Whether or not at what level of standardization or whether it should happen? Andy?

MR. OTT: I can certainly talk about whether it should happen. I think I would throw in I think it has to happen. And again, I think obviously Dave, I and Roberto have to share data with each other.

In fact, when PJM West was implemented, one of the largest challenges again we had to bringing that in was getting the real time data model in and getting it to work. Again, it was the biggest single effort that we had to do. So those kinds of things, again, as you bring models together.

But I think the other thing we're missing is again when I try to give m y data model to my participants so that they can take the same model I have, use the six-month-old data that I post and do analysis to get confident, or that they understand what's going on. I mean, it's very difficult for me to give them the data because, again, in the type of structure, the breaker format type, it's really difficult, and that's the whole CIM issue, right?

But I think beyond that then you go into the market model itself. And to be honest, I think the best folks to be held accountable to get that market model standard and more or less to make it is probably you all

telling us, the RTOs, you know, get a model together and then make it happen. Because we're the ones who know the data and we know the impact on our participants. In other words, we're sort of right in the middle between the users, if you will.

So I think it has to happen. I agree.

MS. SILVERSTEIN: We have painful repeated experience of organizations composed of one group of players within the market, and I don't mean to say that ISOs and RTOs are just another player, but, you know, trust me, I'll take care of you is a little nervous-making. And we would want, as I think all the market participants would want to be sure that when you say trust me, I'll take care of you, will get us a product, a software thing that meets your needs, generators, market monitors, load-serving entities.

I see this as being a bigger group of players at the table than just RTO and ISO IT guys. Is that correct?

MR. WATKINS: That's I think what we were thinking. You know, I don't think any of us knows the right model for doing this, but I think I've heard a consistent theme that says please don't tell us the data standards and don't be specific on that.

But it seems to me I'm also hearing, and I think we believe this, you need to say, establish a data standard that everyone can talk to and everyone can plug their

modules and pieces into so there's competition on the vendor end and so that everyone can play on a level playing field.

And then I think our thought would be, let us do that. And that was the thought I think with that picture I was trying to paint, which is I don't care. I really don't. And I don't think our group does. What we care about is there's a viable model for getting this done, and our model was, in this case, vendors know all that because they're putting all these systems in for us. Guide them. You know, don't let them be the sealers of a standard, let them be the makers of the standard and then have someone else approve it and have them involved with the customers, the ISOs, the merchants and so on.

I don't know the right model, but it seems like it does need a wider group and it need something that's self-motivated, that's involved with knowing the technical details of it.

MR. PALIZA: Talking about pain, I think, you know, I think it needs to be emphasized the need for these standards to change the models. These markets are based on State Estimator models, State Estimator solutions.

Right now the Midwest ISO is trying to put together one of the largest State Estimation processes in the Eastern Interconnection, and we have to deal with Vendor A, Vendor B model, Vendor C model, you know, and trying to

make them compatible so that we can merge these models. And the impact on that is, there is a significant effort in converting these models and make them compatible and eventually merge them into a model that we need.

So there is an expense, a significant expense that industry is paying for not having these standards. I took Jay's comment to mean that there should be I think there is going to be definitely in this effort of the standard market implementation a short-term goal and a long-term goal. We're trying to get there as soon as we can with the tools that we have and the resources that are available, but at the same time, we shouldn't lose sight of where we should be going, you know, five years out there.

MR. FINNEY: Personally, you know, I do like the CIM even if it's not specified explicitly, if for no other reason than it is a standard, it is big, and it is working. So it is a good place to extend as any.

My expectation for the NOPR in this area is I would like to see standards at least asked for or required in three different areas explicitly.

One is for exchange of data between the RTOs, which we heard 30 minutes ago. Also, to standardize the data access from the market participants.

Here again, the RTOs here have done a great job of making their data available through applications such as E-Suites, for example, but there has been no real effort to make sure that the way it is done in Market A is the same way it is done in Market B.

And the third helps break down that incumbent's advantage that you mentioned, which is to require standards for data transfer, API interoperability, between the components inside.

Those are three very distinct areas.

MS. SILVERSTEIN: Between the components inside, do you mean from module to module to module?

MR. FINNEY: Exactly. A silly anaolgy is pretend there was a natural monopoly in baking bread. It may be cheaper in incremental update to build a combination

oven/bread slicer that meets scope and gets that done quickly.

But if while you do that you are not forced to specify what is the interface between an oven and a bread slicer, then you can get FAA legacy software propagating forward throughout time.

So the introduction of standards can actually slow us down, right, a little bit with long-term benefits that allow us to have swappable components.

MR. BRITTON: I want to go back to my previous point and earlier presentation, which is prioritize and make sure of the cost/benefit cases. You should not treat data standard as one thing, at the very, very least.

I think the focus from the discussions has by and large been on model exchange as the highest priority area. I totally support that. And it is also, by the way, the place where CIM is at least an 80 percent proven commodity. There have been vendor-to-vendor exchanges successfully done via the CIM.

You cannot really say that very much about other aspects of it.

But even in that area, we should recognize that there are a couple of different problems. One of them is exchange of whole models, which is what the CIM has been used for so far.

The other is the process of maintaining models. Now I personally believe, and I think others that I've talked to that really looked at this problem go in the direction that exchanging whole models is not the way that you're going to maintain models in the long run.

What you want to do is get change reports up from the sources of the information. Those are the owners and operators of the transmission system. They are not even the same people that you typically get the original contributions of models from to build your first model.

In fact, getting switched over to that process is kind of important because the initial models that get created probably don't have the quality they could have if they had been able to go to all the original sources of data. That just wasn't practical in getting things initialized.

So we have got one part of the problem that we're close to a solution on, and another part of the problem that really hasn't been well addressed yet.

We need to understand that this whole area of data standards is like that. There are compartments that are relatively easy to approach and compartments that are not, and we are going to have to have a process that works with that.

MS. SILVERSTEIN: Let me very quickly thank all

of you for being very good at using your microphones, but I wanted to ask you to do one more thing. Readjust your name tags and your water bottle to make sure that they're facing that lady right there so that she knows who you are and who is talking.

Thank you, very much.

So let me just make sure. You all are pretty much inviting us to tell you to standardize something, and we're starting with the data.

I wanted to ask you a follow-up question about that. That is, in terms of timing if for the sake of argument the draft NOPR, the Notice of Proposed Rulemaking that comes out in two weeks says please standardize. Chat amongst yourselves. Develop a group. Develop a process. Start data standardization.

Is an invitation and a NOPR good enough for ya'll to start organizing yourselves? Do you need additional support and facilitation from us to get this started in August or September instead of waiting until the final rule comes out in December?

MR. THOMPSON: I was going to suggest, I mean this is certainly a process everybody recognizes the benefits of, but it's going to be a difficult process.

There are a couple of models for this. The CIM, development of the CIM model was one. The electronic

tagging effort, et cetera. These are not simple processes at all.

I think that maybe one of the things that should be--that this topic ought to be a subject of one of your, of the workshops that you are planning to have here after you release the NOPR to try to develop a plan for how to go about getting this done, and getting it done in a time frame where we're not going to spend the next three or four years waiting to see how the standards turn out.

And at the same time, we are trying to develop approaches to meeting the other requirements in a system software implementation of the SMD.

MS. SILVERSTEIN: So ya'll should set aside a day in September, then, because we will be doing that very thing. That conference will be on the topic of data standardization.

You notice I like to close the deal right away?

The next deal I want to know whether we're looking at is what else do you want us to be inviting you to standardize in the NOPR? Make us an offer. Oh, you're the one.

MR. O'NEILL: How about test data sets, benchmarking problems, things like that? Can the group get together and put together a set of test problems so that people can compare their algorithmic development and

essentially just have standardized ways of bragging about doing business?

MR. THOMPSON: Well, I think maybe one of the initial parts of that ought to be the definition of what particular aspects really need to have benchmarks established for them. Because there--

MR. O'NEILL: Can I have your proxy, Andy?

(Laughter.)

(Mr. Ott leaves.)

MR. THOMPSON: What are the specific areas of the Standard Market Design that need to be benchmarked, and for what? It would be, I would suggest, one of the first subjects there that needs to be understood.

MR. O'NEILL: Certainly--well I mean you can just rattle off certainly the State Estimator. It would be nice to have some State Estimator data sets.

Certainly the Unit Commitment problem. You yourself said that you were starting to get backed up with all the passes through the Unit Commitment. There are people who are working on that on a regular basis.

And our suggestion that option rights be included in the Standard Transmission Rights proposal raised a lot of at least hand wringing on whether or not they were computable.

Now people are claiming, yes, they have solved

these problems. That they can hardly press the enter button before the problems get solved. But we're not sure exactly what they're solving. And what we need to do is to say, okay, here is the problem that is recognized as a difficult problem because PJM, or New York, or PJM-MISO and SPP get together and say here is a hard problem. And then people can go to work on it and they can tell us: We solved this problem. We did it this fast. Here's the value of the, the total bid value that we maximized so that we can get a measure of how good the software was. And we know what you have.

Right now when we talk to people, they all make wonderful claims and I tend to believe them, but I don't know exactly how to compare the claims.

MR. FINNEY: I support it. That's easy for me because I'm on the vendor side and this is the type of thing that we like to do.

I would like to hear from the RTO participants, you know, what level of priority they would place upon this.

MS. SILVERSTEIN: Mr. Britton has been waiting for a couple of minutes. We'll go to him first.

MR. BRITTON: I support the benchmark initiative. I do think clean problems are a key, and those need to come from real systems to be very meaningful. So I really echo what John said. It's the ISO/RTO community that needs to be

in this.

MR. LA PLANTE: Yes. We would support that also. There's also I think an assumption involved with doing that, which is that the software that's doing it is in fact consistent with the Standard Market Design, and whether or not we may need a separate process or a separate effort to actually certify that the software is solving the right problem.

So that is sort of hidden. Before we get there, we have to understand that and make sure of that.

MS. SILVERSTEIN: I was promised this morning that if the software gave you a result that didn't match reality, you just needed rules to manage around that.

MR. LA PLANTE: Well you could do both. You could do it either way, but you've got to pick a way.

(Laughter.)

MS. SILVERSTEIN: Is there any objection within this community to doing benchmark data sets on test problems?

MR. ALSAC: One issue will be what will be the format of these benchmarks. Because we can create a benchmark format which is not going to be standard format and then we will be having now two formats.

So I think first the format we have to create, and then the test systems. We can do both simultaneously,

but they have to be very correlated.

MS. SILVERSTEIN: My suspicion is there might be a little bit of a chicken and egg problem here and we can put the entire food chain together by having the folks who do this, the data standardization design the test problem and make it somewhat referential in terms of test-out, do your data standards work by designing your data--your problem.

MR. ALSAC: That will work.

Another point I have is that there are two kinds of data. One is like interchange of data between ISOs or between vendors, and that is very detailed data. Another data is data provided to participants. And as Andy says, ISOs have these very detailed models.

But participants don't have State Estimators, topology problems, nothing. So we have to separate these two issues.

What do we provide to the participants so that they can handle that data and use their stand-along tools to very quickly absorb it to their own systems?

And then what is the much more detailed models which ISOs interchange vendors use.

So there are two separate. One is more important maybe, but if we are going to train participants, the data for participants is extremely critical.

MS. SILVERSTEIN: I suspect that if we make it clear that we would like participants to participate in the data standardization process by telling us what data they want and need, that they would be more than happy to show up and we can use our friends at the trade associations to make sure that they show. Yes?

MR. WATKINS: I don't know the answer, but it seems to me, I'm not sure what benefit you gain from doing standard benchmarks when you define the function itself. Each RTO or ISO has a very complex set of models that they have to employ anyway and do extensive testing on, and they have to do that. They have to do it on their data, on their market system.

So it is an interesting thing maybe to learn how someone's system performed against another on a standard benchmark, maybe, but--and that might be the right thing. My only question is: Is that a useful activity in the time it takes to develop such things compared to the real work we have at hand?

That is the only question I would ask.

MS. SILVERSTEIN: Why don't we put the issue of benchmark data sets which clearly the vendors are more enamored of than perhaps the ISOs are, why don't we put that question aside to discuss at our September workshop, where we'll hope to see you all again, on the matter of data

standardization. We will commit an hour or two to discuss the: Do we need to do benchmarking of data, as well, a common data problem?

The next question is: If we need a standards organization, to what degree does--and I'm hearing you all want one--to what degree does, how detailed an intervention does FERC have to get to make that happen?

We have models like NASB, like the Coalition For Uniform Business Rules, EPRI has initiated some work, IEEE has done some. Do we need to say you've got to do it and it looks like this? Or do we just stand back and say please make it happen and see what ya'll toss back at us?

MR. LA PLANTE: Are you talking about data standards now? Or rules, business rules? Or interpreting the Standard Market Design standards? If a change is needed to the Standard Market Design, that thing? Or is this more on a higher--

MS. SILVERSTEIN: Well, we have this gruesome process called regulation and comments and cases, which is where people tell us they want changes to the Standard Market Design.

I was thinking more of the kind of entity that one of you was talking about, a technical--maybe it was ERCOT; I don't know who it was--but there are tech work groups that sort of mastermind the implementation and decide

in common if there's some ambiguity, this is how we're going to agree to interpret it?

MR. RISTANOVIC: It all depends on the goal, because time is very short. If we don't standardize components and data modeling in the next two or three months, so many systems will start without standards and it will be no point doing it later, because they will go regular way. All them will be customized, difficult to change. The same market design, but each of them would be one-of-a-kind and you don't have competition. You have high prices. You have expensive testing and re-testing and expensive maintenance.

In standardization bodies where you have no strong hand, it usually takes a very, very long time to standardize anything.

We are very close to standardize what is needed to support energy market. CIM has a lot that we need for energy markets. But there is very little missing. What we need? We need strong FERC involvement. We need FERC to get requirements quickly for vendors and other interested parties, to hire some for-profit organization to standardize components, to standardize extensions on CIM; that for-profit organization to report back to FERC.

We can all comment to that, and quickly come up with something. That is important for all the systems

coming up in the next five to six months, CTRANS, Northeast RTO, Midwest ISO, everybody. If we don't do it in the next three to six months, it is going to be late for most of these systems.

I hear also the discussion about priorities. We are talking about priorities for something I call peanuts. When you think about templates for OASIS which are similar to what you're talking about front end for market portals, we're talking about relatively small amount of data and interfaces for market participants.

The benefit of that, yes, is huge for visibility for market participants, but impact on the cost of building RTOs and maintaining RTOs is almost nonexistent. Because you have to maintain binary interfaces, and every time you change something you have to support all the interfaces.

So market participant says I don't want to switch to new interface, I want to use the old one. So you have to give them the capability.

My point is that we are very close, and if you want to have competition, if you want to have a lower cost of testing and building system and maintaining it, it is time that FERC has to be very active.

Later, once this process, like speed-up process is moved and some organization like KEMA can be for nonprofit organization or has enough knowledge to speed up

this first step, we can push further. We can send it to EPRI, go through IC Rule 13, make it international standard, because that's kind of slow process but it's still good because it can expand this worldwide.

Because what we are doing here, everybody worldwide is going to be watching soon. And if you don't standardize, nobody will standardize. And this mushroom of cost, which looks good for vendors but believe me is not good, is going to propagate worldwide.

So it is very important to act quickly.

MR. BRITTON: I go along with what Petar said in at least one thing. That is, we should get a standards process in place quickly.

I am operating under the presumption here that at least some items are going to be the subject of standards and need a standards body with a good process. And in that regard, the two really important things are a neutral forum for discussion and somebody with a proven process.

Because the process itself takes a while to wrangle out, if you just throw a bunch of people in a room and have them start at it.

So if you look at a model like an OMG or something like that, they've got a very well established process. It is valuable--I'm not suggesting that as an organization here, but you want to hook up with somebody who

already knows how to vote, and how to decide on who wins if there's contention, and all those kinds of things.

I don't go along with Peter's assessment of the CIM and how close it is, and I also have a feeling I'd probably differ with him about exactly where the placement of standards would be most useful, but, you know, what I want to urge is that we get into a dialogue within the standards process where we can get down to more of the issues of the practicality of standardizing in one way or another and in one portion or another.

I don't think we're going to get a good discussion of those issues in this kind of a higher level forum.

MS. SILVERSTEIN: That may be true, but it's not a bad start.

MR. BRITTON: It's a start, yes.

MS. SILVERSTEIN: Anyone else?

DR. IRISARRI: I think it is fundamental at this point in time to fully specify the interfaces, the external interfaces into the RTO systems. I disagree with the need to fully specify the data model that is used by Vendor A, Vendor B, Vendor C, or even the technology necessary to implement that data model.

If you have a very clear specification of what data is needed, at what frequency should it be provided, in what form that it can be provided, and, similarly, a very clear specification on how to extract data out to market

participants and other RTOs or any other organizations, including market monitors, that is a very step forward.

Let us, the rest of the developers, decide on how and whether we are going to implement this model, whether we are going to use CIM, if it is appropriate for the task, or any other of the standards that are being offered in the market at the moment.

MR. LaPLANTE: It seems to me that there are two different things: A standardized and an open system. I think that in the short term, you can open -- any vendor can open on a system so everybody can look at it and develop another way. In the meantime, then we can develop the standard, go develop the standard which will take a long time, and I don't know how long it took EPRI to develop the seam. And the way that you are talking about is open system, and Jay talked about that before. You know, in a short time right now, we don't have a lot of ties, so if vendors would open their system and document it to show what is -- you want to get it out from my system, this is the way to get it out and doing that.

And then maybe develop the standard along the way, but develop the standard take a long time to develop the standard, that's what I got, right?

MR. FINNEY: I agree that that helps expedite the schedule, but requiring open system, open components without

standards results in systems that are not open, because if I am a boutique shop trying to penetrate a market and I have to write a piece of software, I have to decide, unless I already have a contract to deliver, which of the five systems out there I'm going to adhere to.

So an initial approach to require open systems has to be followed almost immediately by the standards to associate. Otherwise, it's a wish that cannot become a reality.

MR. BRITTON: I don't think that's quite true. I think this is sort of analogous to having different import front ends on your wordprocessor as the way the world was before Microsoft took it over, you know.

And you can cope quite well adapting, putting a layer that goes to System A, and another layer that goes to System B, in most cases. Now, it's not universally true, but I think that it most cases, it's true.

The other comment that I wanted to go back to on the open issue is open -- with regard to getting data, I mean, I have just been involved in this same process that Roberta was talking about earlier, trying to put a model together.

And although common standards would be nice in the format, the biggest obstacle is access to the data. And if we had gotten access to the data, we've got lots of

clever programmers who can get it out and get it into the right forms.

In the initial data preparation stage of a system, you don't have to write perfect software to do perfect transformations. You only have to write 95 percent, and you'd be surprised how much easier it is to write 95 percent code.

You can get most of the information translated with code, and the rest, you can fix up manually or any other method you can figure out, and you wind up using spreadsheets and lots of different little tools to work the data.

Because it's a one-time preparation problem, access to the data is the number one problem.

MS. SILVERSTEIN: I'd like to close this out with two more things: And the first is to ask those of you who are sitting at the table if you have any additional information, short pieces of information or requests or directions to give us, none of which, I hope, will address pending cases.

And the second is to invite those of you in the audience to either ask questions of the folks who are sitting here, or to offer us on the FERC Staff, your views. So let's start by whether any of you here at the table have any last pieces of wisdom or requests that you want to give

us.

MR. ALSAC: This may sound a bit strange, but please give us more time, and let us know, beforehand, requirements, so that we can come here better prepared, addressing what you really need to discuss.

MS. SILVERSTEIN: You all did very nicely today. Thank you.

MR. LaPLANTE: There was a point made earlier this morning that the financial models don't need to be as accurate or as precise as the physical models. It's been our experience that if the financial and physical don't tie out, and if the financial isn't based on what really happened in reality, the market participants get very upset.

So you really do need to have them matched as closely as possible. We can't really cheat on the financial side.

MS. SILVERSTEIN: Anyone from the audience who wants to come on up to a microphone and tell us what you think or ask a question?

MR. AVNAESH JAYANTILAL: I agree with standards, but with most financial markets, your products change over time. So remember they are not going to be static standards. The group must go with dynamic change as you move forward. Look at PJM, for instance, look how they grew. It was not a bang; it was all in one.

So remember that when you create a standard, it should not be a static standard.

MS. SILVERSTEIN: Thank you. Yes, sir?

MR. MITCHELL: Gary Mitchell of the SPI Group. We have the retail hub in Ontario. I'm just wondering if anybody has really looked at the open system, the standards that are on the Ontario Energy Board website? That's been used in Ontario.

Right now, there are three hubs active in Ontario. They communicate with each other. Myself, we're the largest vendor out there, but we have over 20 CIS systems hooked up to our system right now.

Our output is, we have about 20-percent switch-over rate since the market opened. That's on the retail side. Our standard is very strong. It's XML-based; it's schema-based, multi-schemas.

I just want you to actually take a look at what the regulator has done there. There are a lot of issues that were brought up today that have been resolved in Ontario, have been discussed in Ontario.

Some of the things, for example, in Ontario, there was not an ISO that built the retail system; it was private companies that actually built it. We were put into a room for two years to build that standard that's sitting on the OEB website.

We had to give it to them, once we were done. That's the one that sits there. After the market is open -- prior to market opening, we had a working group. The working group was with four different vendors, plus I think it was three large LDCs and one retailer. After the market, now there's about 25 people in the working group.

They're all working together to get this resolved. The market is working very well there. The systems are very active, my market itself, with six million transactions since market opened. So, there are systems out there that do work; there are standards that are already out there as what was discussed here.

The reason why I bring this up is nobody has talked about the Ontario market, and it is something that should really be looked at.

MS. SILVERSTEIN: Thank you very much. So, we'd like to plagiarize from the best, and we also would like to use strawmen to move things along faster, rather than starting from scratch, so a homework assignment for you all before our September workshop is to -- can you come back, Gary, and tell us the website to go looking at?

MR. MITCHELL: It's www.oeb.gov.on.ca.

MS. SILVERSTEIN: www.oeb.gov.on.ca?

MR. MITCHELL: Right.

MS. SILVERSTEIN: So --

MR. MITCHELL: And it's the EBT standards that are sitting there. There has been quite a bit of work done on it already. Like I said, it is a system that's working. We have resolved a lot of the issues that are happening within Texas and such right now, with switch-overs and stuff like that. The system is working fairly strong there right now.

MS. SILVERSTEIN: So, maybe one of the things you all can be prepared to come back and talk about in September is whether those are an appropriate strawman for us to build on going forward. Thank you very much.

MR. LIVELY: My name is Mark Lively. The question that I look at is how the standard market design should be able to handle such issues as loop flow, and the cash-out of inadvertent interchange, in that most of the discussion today has been about a forwards market, as opposed to a concurrent spot market for those little issues of how the physics of the system works in getting the cash to flow the same way the electrons flow.

MS. SILVERSTEIN: Is that a question for them or a question for us?

MR. LIVELY: A question for them. Since they're talking about standard market design and how to get the data to work for the systems interface, the seams managements between them, they need to be sure that they are collecting

the right data and restoring the data so that they can cash out those unscheduled flows of electricity so that when things like the expansion of the MISO and PJM results in loop flows through TVA and the Southern Company and CP&L and the companies in the South, the C-trends, how can they then cash that out, and how they can have data systems in place and operating systems in place to provide that cash-out.

(No response.)

MS. SILVERSTEIN: Sorry, Mark, we're not hearing a lot of takers for that one. Yes, sir?

MR. MAYER SASSON: Thank you. Mayer Sasson from Con Edison in New York. Transmission owners in New York feel that what will benefit the best, consumers, is to have access to the largest markets possible.

And I think we also feel that is what is going to benefit the most, the suppliers, to be able to sell into the largest market possible. There are two ways we can do that:

One is to try to merge organizations and get the biggest possible organization, with everybody inside, but the other one, I think Guillermo Irisarri mentioned it tangentially today, which is to have the systems in the different ISOs and RTOs interoperate.

And that is going to require more than just data exchange. We need to have coordination between the solutions, for example, a unit commitment process that

actually solves in stages in the different areas, and then somehow comes together.

I'm not sure if everybody is aware of this, but in this room, in this longest table and with some of the people that are here, there is enormous talent with 20, 30 years of experience in developing software tools, but not the software itself, but the analytical tools necessary, that I think it's a problem that we can solve if we really put ourselves into doing this. So that's an idea I had not heard this morning.

MS. SILVERSTEIN: Thank you. Any more comments, suggestions, questions? Yes, we have a winner.

MR. BILL PETTITT: Bill Pettitt of the IMO. I just wanted to make sure that this panel or this is addressed -- is the market surveillance or market monitoring is a big item in our systems. It's one of the most difficult things to put together.

Of all the systems we're putting together, it's not so much the EMS and the market systems, it's actually the monitoring of it that's the big thing.

On the settlement side of things, collecting all the meters is a big job, as well. When we get the -- if we get a bigger RTO, collecting x-number of meters at five-minute intervals, it's a challenge in itself. We have a challenge in collecting the number of meters we have right

now.

And the other thing that I wanted to address was the separation of the operation from actually the price end, the settlement part of things. Right now, we have an integrated operating system and settlement system, or basically the price is computed right away, and if the price isn't computed right away, it's lost.

But we can compute the price later, if we keep that information on hand, so if we have systems that are available to keep the information, price is computed after the fact, not on a continuous basis, we still have a dispatch being done on a continuous basis, no matter what. So these two things do not need to be integrated, but they are now. That might simplify things for these systems.

MS. SILVERSTEIN: Thank you very much. As a thank you present to all of you for giving us your time and your expertise, we're going to let you go half a hour early.

I found this very useful. I think the rest of our staff members have, and I hope you found something in it to make the trip worthwhile. Thank you so much for your commitment and your participation, and we'll look forward to seeing you again in a couple of months.

(Whereupon, at 4:25 p.m., the Conference was concluded.)